PAGE'S WEEKLY.—January 19, 1906. Thin Paper Copy for Circulation Abroad.

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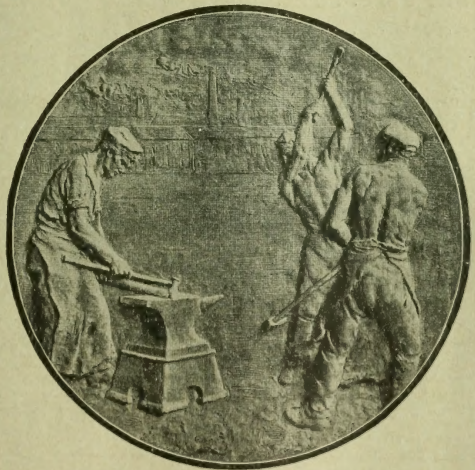
PAGE'S WEEKLY



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Russia, St. Petersburg: 14, Nevsky Prospect.
Italy, Rome: 307 Corso.
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PAGE'S WEEKLY

Miscellaneous

PAGE'S WEEKLY — Miscellaneous

PAGE'S WEEKLY

Miscellaneous

"ZECO" Brand.

Blue Planished and Glazed Steel Sheets for Lagging and Covering generally.

ZEITZ & Co., 21, Lime St., London, E.C.

HARTLEY & SUGDEN LIMITED TRADE MARK HALIFAX

Heating Apparatus

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Refuse Destructors.

Write for particulars to:—

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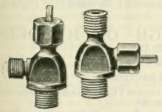

The

Scotch & Irish Oxygen Co., Ltd.,

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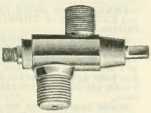
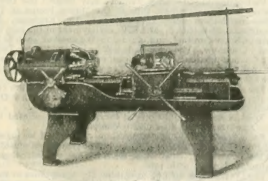
Valves for Gas Bottles, Refrigerating Plant, etc., in Bronze, Steel, and Aluminium.

Reducing Valves, Keys, and all Fittings for Compressed Gases.



HARTNESS

FLAT TURRET LATHE



The only Turret Lathe with Cross Sliding Head.

JONES & LAMSON MACHINE CO.,

"JUBILEE BUILDINGS,"

97, Queen Victoria Street, LONDON.

JOSEPH BOOTH BROS., LTD., RODLEY, LEEDS. See next week.

LIFTING MACHINERY.

THOS. W. WARD, ALBION WORKS, SHEFFIELD. See Page 17.

MACHINE TOOLS.

THE SHANNON, LTD., Ropemaker St., London, E.C. See Page 71.

OFFICE APPLIANCES.

Have you seen our Advertisement on page ~~69~~ 49 ? A glance at it may save you £500 per annum.— ED. BENNIS & CO., Ltd., BOLTON.

CONTRACTS.

PLYMOUTH CORPORATION ELECTRICITY DEPARTMENT.

The Plymouth Corporation Electricity Department is prepared to receive TENDERS for the SUPPLY of the UNDERMENTIONED STORES during the twelve months ending March 31st, 1907 :—

1. Lubricating Oils.
2. Engine Waste, Wipers, &c.
3. Paper-Insulated Cables.
4. Transformers.
5. A.C. Meters.

Copies of Specifications may be obtained on application to the undersigned not later than January 20th, and on a deposit of 10s. for each copy, which will be returned on receipt of a *bona fide* Tender upon the prescribed form and within the stated time.

Sealed Tenders, duly endorsed, to be delivered to the undersigned not later than January 24th, 1906.

(Signed) E. G. OKELL,
Borough Electrical Engineer.

Prince Rock, Plymouth, January 1st, 1906.

CORPORATION OF WIMBLEDON.
TO ENGINEERS.

The Wimbledon Corporation invite TENDERS for the SUPPLY and FIXING of AIR COMPRESSORS to be electrically driven, at the Pumping Station, Durnsford Road, Wimbledon.

Plans and Specifications may be obtained on application to the undersigned.

Tenders, endorsed "Air Plant," and addressed to the Chairman of the Highways and Sewerage Committee, must be delivered at the Town Hall on or before noon on Monday, January 22nd, 1906.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
C. H. COOPER, M.I.C.E.,
Town Hall, Wimbledon, Borough Engineer and Surveyor.
December 20th, 1905.

BOROUGH OF STRATFORD-ON-AVON.
SEWAGE DISPOSAL WORKS.

TENDERS are invited for the MANUFACTURE, DELIVERY, and ERECTION of THREE SETS of GAS or OIL ENGINES and PUMPS.

Specification and Drawings may be obtained at the Offices of the Engineers, Messrs. WILLCOX AND RAIKES, Union Chambers, 63, Temple Row, Birmingham, on or after January 1st, 1906, on payment of a deposit of Two Guineas, which will be refunded (after the Contract has been decided upon) to those persons who have sent in a *bona fide* Tender and who have returned the whole of the documents entrusted to them.

Sealed Tenders, upon the forms supplied, endorsed "Stratford-on-Avon Sewage Disposal Pumping Machinery," to be delivered at my office not later than 12 o'clock noon on January 22nd, 1906.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
ROBERT LUNN,
Town Clerk's Office, Stratford-on-Avon, Town Clerk.
December 22nd, 1905.

WILTON DRAINAGE. — CONTRACT No. 1.
TO CONTRACTORS.

The Mayor and Corporation of Wilton are prepared to receive TENDERS for the CONSTRUCTION of the following WORKS :—

About 13 miles of Patent Stoneware and Iron Sewers, ranging in size from 8-in. to 30-in., with the necessary Manholes and Flushing Tanks, together with Pumping Station, Rising Main, and other works, in accordance with the Specification and Plans prepared by Messrs. JOHN TAYLOR, SONS AND SANTO CRIMP, Civil Engineers.

Copies of the Specification and Quantities, with form of Tender, may be obtained from, and the Drawings inspected at, the offices of the said Messrs. JOHN TAYLOR, SONS AND SANTO CRIMP, 27, Great George Street, Westminster, S.W., upon payment of £5 (cheque only), which will be returned upon the receipt of a *bona fide* Tender.

Tenders, endorsed "Wilton Drainage, Contract No. 1," are to be delivered to me on or before Saturday, the third day of February, 1906.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
HENRY J. KING,
Wilton, Salisbury, January 6th, 1906. Town Clerk.

METROPOLITAN BOROUGH OF FULHAM.
ELECTRICITY DEPARTMENT.
CONTRACT "S."

The Council is prepared to receive TENDERS for the SUPPLY and ERECTION of

(*a*) Steam Piping.
(*b*) Water and Exhaust Piping.

Specifications and forms of Tender may be obtained from the Borough Electrical and Consulting Engineer, Mr. ARTHUR J. FULLER, after the 13th instant, on payment of a deposit of One Guinea, which will be returned on receipt of a *bona fide* tender.

Tenders, made out on the form supplied, addressed to the Town Clerk, Town Hall, Fulham, and endorsed "Tender for Contract S," to be delivered at the Town Hall not later than 12 noon on Wednesday, January 31st, 1906.

Contractors will be required to abide by the Council's standing orders as to hours of labour and rates of pay.

The lowest or any Tender not necessarily accepted.

By order,
R. M. PRESCOTT,
Town Clerk.

Town Hall, Fulham, S.W., January 9th, 1906.

SUPPLY AND ERECTION OF A REFUSE DESTRUCTOR.

TENDERS are invited by the Municipality of Pretoria, Transvaal, for the SUPPLY and ERECTION of a REFUSE DESTRUCTOR, capable of treating 60 tons of refuse per diem.

Tender Forms, Specification of the Destructor, Dimensions, and Levels of the Site upon which it will be erected, may be obtained on application to the Town Engineer, Pretoria, or at the office of Messrs. MOSENTHAL, SONS, AND CO., 72, Basinghall Street, London, E.C.

The successful tenderer will be required to pay to workmen employed on the erection of the above works wages at rates not less, and to observe hours of labour not greater, than the rates and hours set out in a list to be seen at the office of Messrs. MOSENTHAL, SONS, AND CO.; such rates of wages and hours of labour will form part of the contract to be entered into by the successful tenderer.

Tenders, enclosed in sealed envelopes, and endorsed "Tenders for Supply and Erection of Refuse Destructor at Pretoria," must reach the undersigned not later than March 15th, 1906, or the Town Clerk, Pretoria, not later than noon on April 6th, 1906.

The lowest or any Tender will not necessarily be accepted.

MOSENTHAL, SONS, AND CO.
Representing Municipality of Pretoria.

COUNTY BOROUGH OF HUDDERSFIELD.
SEWAGE DISPOSAL WORKS.
TO CONTRACTORS.

The Corporation are prepared to receive TENDERS from competent Contractors for the following works, viz. :—

Contract No. 1.—Intercepting Sewer, Sedimentation Tanks, Detritus Tanks, Bacteria Beds, and other works contingent thereon.
Contract No. 2.—Gas Plants, Gas Engines, Generators, Air Compressors and Motors, Pumps and Motors, Sludge Pumps, Switchboard, &c.
Contract No. 3.—Sewage Screen and Elevator.
Contract No. 4.—Sewage Discharge Recorder.
Contract No. 5.—Sewage Distributors and Cables.

Parties desiring to submit Tenders may inspect the Drawings and obtain the Specifications, Bills of Quantities, Forms of Tender, and other particulars upon application to the Engineer, Mr. K. F. CAMPBELL, M.Inst.C.E., M.I.E.E., on payment of the sum of £5 in the case of No. 1 Contract, and £2 2s. in the case of each of Nos. 2, 3, 4, and 5 Contracts. These amounts will be returned to the Tenderer after the Council have come to a decision on the Tenders received, provided he shall have sent in a *bona fide* Tender and shall not have withdrawn the same.

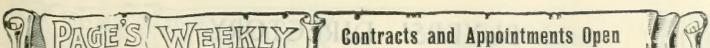
The successful Tenderers will be required to execute a contract, the draft of which may be inspected at the Town Clerk's Office, Town Hall, between 10 and 4 o'clock, except on Saturdays.

Tenders must be on the official forms, and the printed instructions contained therein must be strictly complied with.

Each Tender, in the sealed envelope (which will be provided by the Engineer), along with the filled-up Bill of Quantities, must be delivered to the Town Clerk, Town Hall, Huddersfield, not later than 10 a.m. on Saturday, January 27th, 1906.

The Corporation do not guarantee the acceptance of the lowest or any Tender, or the Tender of any person or persons who have not extensive experience in the carrying out of similar works to those described.

J. HENRY FIELD,
Town Clerk's Office, Town Clerk.
January 1st, 1906.



BATTERSEA BOROUGH COUNCIL.
The Electricity Committee invite TENDERS for the following PLANT and MATERIALS:

1. One Set either 750-850 or 1 000 kw. D.C. 460 to 550 volts Steam Generator, Pipe ing and Ejector Condenser.
2. Arc Lamp Columns.
3. Arc Lamps.
4. Arc Lamp Globes.

Copies of Specification and Form of Tender can be obtained on or after January 11th by making application and enclosing the sum of £2 2s. to the Chief Engineer, Electricity Department, Lombard Road, Battersea, which sum will be refunded on receipt of *bona fide* Tender.

Tenders are to be returned, endorsed "Tender for ——," to the undersigned not later than noon Monday, February 5th.

W. MARCUS WILKINS,
Municipal Buildings, Lavender Hill, S.W. Town Clerk.

BURMA RAILWAYS COMPANY, LIMITED.
The Board of Directors of the Burma Railways Company, Limited, are prepared to receive TENDERS for the SUPPLY of MISCELLANEOUS TOOLS and STORES.

Specifications and Forms of Tender can be obtained at the Company's Offices, 109, Gresham House, E.C.

For each Specification a fee of 20s. will be charged, which will not be returned.

Tenders, enclosed in sealed envelopes, and endorsed "Tender for Miscellaneous Tools and Stores," must be delivered not later than noon on Monday, the 22nd inst.

The Directors do not bind themselves to accept the lowest or any Tender.

By order of the Board,
A. G. EGBERT,
9th January, 1906. Managing Director.

TWICKENHAM URBAN DISTRICT COUNCIL.
SEWAGE DISPOSAL WORKS, SECTION "F."
The above Council hereby invite TENDERS for the CONSTRUCTION, &c., of TANKS, FILTERS, CHANNELS, SEWER and other WORKS, at the Sewage Disposal Works, Mereway Road, Twickenham.

Drawings and Specification of the proposed Works may be seen, and copies of the Bill of Quantities obtained, on application at the Office of Mr. FRED. W. PEARCE, F.S.I., Surveyor to the Council, Town Hall, Twickenham, and the payment of a deposit of Three Guineas, which deposit will be returned on receipt by the Council of a *bona fide* Tender.

Drawings, Specification, and a copy of the Bill of Quantities, may also be inspected at the office of Mr. WILLIAM FAIRLEY, Civil Engineer, 69, Victoria Street, Westminster, S.W.

Sealed Tenders, on the forms provided by the Council, are to be delivered to me not later than Twelve o'clock Noon on Wednesday, the 24th day of January, 1906.

The Council do not bind themselves to accept the lowest or any Tender.

By Order, H. JASON SAUNDERS,
Town Hall, Twickenham, Clerk to the Council.
19th December, 1905.

TENDERS FOR CAST-IRON PIPES.—
The Metropolitan Water Board invite TENDERS for the SUPPLY and DELIVERY of about 700 tons of 16-in. CAST-IRON PIPES.

Forms of Tender, with Specification and Conditions of Contract, can be obtained from the undersigned, and Tenders, enclosed in sealed envelopes, addressed to the Clerk of the Board and endorsed "Tender for Cast-Iron Pipes, Enfield," must be delivered at the Offices of the Board not later than 10 a.m. on Monday, January 22nd, 1906.

A. B. PILLING,
Savoy Court, Strand, W.C. Clerk of the Board.
January 3rd, 1906.

CITY OF ABERDEEN.—ELECTRICITY DEPARTMENT.
The Electricity Committee are prepared to receive TENDERS for the SUPPLY and DELIVERY of ONE CAST IRON DISC FLY-WHEEL for fitting to an engine of Willans and Robinson's make—approximate weight 24 tons.

Specification and form of Tender may be obtained from the undersigned upon payment of a deposit of £1, which will be returned on receipt of a *bona fide* Tender.

Tenders, endorsed "Fly-wheel," to be delivered at the Electricity Works not later than noon on Monday, 22nd January.

J. ALEX. BELL,
Corporation Electricity Works, City Electricity Engineer.
Milburn Street, Aberdeen.

BOROUGH OF STOKE-UPON-TRENT
ELECTRICITY COMMITTEE.
CONTRACT 12.
The above Committee invite TENDERS for the SUPPLY and DELIVERY of METERS and DEMAND INDICATORS during the year ending March 31st, 1907.

Specifications and Forms of Tender may be obtained from the undersigned on payment of a deposit of £2 2s., which will be returned on receipt of a *bona fide* Tender.

Tenders to be sent in, addressed "The Electricity Committee, "Electricity Works, Stoke-upon-Trent, not later than January 31st, 1906, and endorsed "Tender for Meters."

The Committee do not bind themselves to accept the lowest or any Tender.

(Signed) P. J. S. TIDDEMAN,
Borough Electrical Engineer.
Electricity Works, Stoke upon-Trent, January 9th, 1906.

APPOINTMENTS OPEN.

COUNTY BOROUGH OF OLDHAM.
JUNIOR ASSISTANT ELECTRICAL ENGINEER.
The Oldham Corporation Electricity Committee invite APPLICATIONS for the position of JUNIOR ASSISTANT ELECTRICAL ENGINEER. Salary £80, advancing to £100 by annual increments of £10. Previous experience in central station essential.

Applications, endorsed "Assistant Electrical Engineer," stating age, experience, &c., together with copies of not more than three recent testimonials, to be sent to Mr. S. WILMOTT NEWINGTON, Borough Electrical Engineer, Oldham, not later than Monday, January 22nd, 1906.

Canvassing will be a disqualification.

Oldham, J. H. HALLSWORTH,
January 10th, 1906. Town Clerk.

AN "INSTITUTION OF NAVAL ARCHITECTS" SCHOLARSHIP, of the annual value of £50, and, subject to certain conditions, tenable for three years, will be OFFERED for COMPETITION by the Council of the above Institution.

Candidates must, at the time of the examination, be students of the Institution, and not less than eighteen or more than twenty-one years of age on March 1st, 1906, and must at that date have been continuously employed for two years upon Naval Architecture or Marine Engineering.

Further particulars and forms of entry and conditions regulating the admission of students, may be obtained from the Secretary, Institution of Naval Architects, 5, Adelphi Terrace, London, W.C.

Applications must be sent in by February 1st, 1906.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR AND WATER ENGINEER.
The Council invite APPLICATIONS for the above APPOINTMENT.

The gentleman appointed will be required to devote his whole time to the duties of his office.

The salary as Surveyor will be £250 per annum, and as Water Engineer to the Joint Water Committee of Swadlincote and Ashby-de-la-Zouch £40 per annum.

The Council district contains an area of 3,415 acres, a population of 19,500, and a rateable value of £65,000.

The Waterworks are situate at Milton and Woodville.

Applications, in candidates' own handwriting, stating age and qualifications, with three recent testimonials, must be sent to me, the undersigned, at the Council Office, not later than Wednesday, January 31st, endorsed "Surveyor."

Three months' notice at any time to determine the engagement.

Canvassing, either directly or indirectly, will be deemed a disqualification.

By order of the Council,
W. A. MUSSON,
Council Office, Clerk.
Belmont Street, Swadlincote,
January 3rd, 1906.

CITY OF AUCKLAND, NEW ZEALAND.
APPOINTMENT OF CITY ENGINEER.
Applications, accompanied by Testimonials, will be received in the Town Clerk's Office, Auckland, New Zealand, until 4 o'clock p.m. on Thursday, February 8th, 1906, for the appointment of City Engineer to the City of Auckland. Conditions of appointment may be seen, and copies obtained, at the office of the High Commissioner for New Zealand, Westminster Chambers, 13, Victoria Street, London, S.W.

HENRY W. WILSON,
September 1st, 1905. Town Clerk.

BUYERS' DIRECTORY.

NOTE.—*The display advertisements of the firms mentioned under each heading can be found readily by reference to the Alphabetical Index to Advertisers on pages* 35, 37, 38 *and* 40.

In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5*s. for each additional section.*

Advertisers' Service Bureau.
British Advertiser Service Bureau, Queen Anne's Chambers, Westminster, S.W.

Artesian Well Machinery.
John Z. Thom, Patricroft, Manchester.

Band Sawing Machines.
Noble & Lund, Ltd., Felling-on-Tyne.

Bearings (Roller).
Hyatt Roller Bearing Co., 47, Victoria Street, London S.W.

Belting.
Binney & Son, Catherine Street, City Road, London, E.C.
Cort, Arthur, & Co., Camberwell, London, S.E.
Fleming, Birkby & Goodall, Ltd., West Grove, Halifax.
Gilmour, W. & O., St. John's Hill, Edinburgh.

Boilers.
Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.
Hartley & Sugden, Ltd., Halifax.
Thompson, John, Wolverhampton.

Boilers (Water-tube).
Babcock & Wilcox, Ltd., Oriel House, Farringdon Street London, E.C.
Stirling Boiler Co., Ltd., Motherwell, N.B.

Bolts, Nuts, Rivets, etc.
Herbert W. Periam, Ltd., Floodgate Street Works, Birmingham.
T. D. Robinson & Co., Ltd., Derby.

Books.
Griffin, Charles, & Co., Exeter Street, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.
Spon, E. & N., 125, Strand, W.C.

Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.

Cables.
Callender's Cable and Construction Co., Ltd.

Case-Hardening Compounds.
Hy. Miller & Co., Millgarth Works, Leeds.

Castings.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Catalogues, Printing, &c.
Atlantic Press, Ltd., Weymouth Street, Manchester.
Spottiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.
Stafford, Arthur, & Co., Denton, Manchester.

Chucks.
Fairbanks Co., 78-80, City Road, London, E.C.

Cisterns, Tanks, &c.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
Clayton, Son & Co., Ltd., Hunslet, Leeds.
F. A. Keep, Junon & Co., Barn Street, Birmingham.

Clutches (Friction).
David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

Coke Oven Expert.
Mallmann, P. J., 110-118, Victoria Street, S.W.

Condensing Plant.
Benn, Sykes, Haslingden, near Manchester.
Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.
Mirrlees-Watson & Co., Ltd., Glasgow.

Consulting Engineers.
Gibbs, John, & Son, 80, Juke Street, Liverpool.
G. H. Hughes, A.M.I.M.E., 19, Old Queen Street, Westminster, S.W.
Melville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A.
Mount-Haes, A., M.I.Mech.E., M.I.M.E., 11, Ironmonger Lane, London, E.C.

Continental Railway Arrangements.
Northern Railway of France.
South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.
Adolf Bleichert & Co., Leipzig-Gohlis, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Temperley Transporter Co., 72, Bishopsgate Street Within, London, E.C.

Copper and Brass.
W. Hepton & Son, Hunslet Lane, Leeds.

Coverings (Boiler).
Magnesia Covering Ltd., Washington Station, co. Durham.

Cranes, Travellers, Winches, etc.
Joseph Booth & Bros. Ltd., Rodley, Leeds.
Thomas Broadbent & Sons, Ltd., Huddersfield.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.
Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.
E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soho, Birmingham.

Destructors.
Heenan & Froude, 4, Chapel Walks, Manchester.
Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.
Delange & Cie, Mcc., Hoboken, near Antwerp
Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne
Swift, George, Clarence Ironworks, Halifax.

Economisers.
E. Green & Son, Ltd., Manchester.

Ejectors (Pneumatic).
Hughes & Lancaster, 16, Victoria Street, London, S.W.

Electrical Apparatus.
Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.
British Westinghouse Electric and Manufacturing Co., Ltd., Norfolk Street, Strand, London, W.C.
Broadbent, T. W., Victoria Electrical Works, Huddersfield.
Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.
Ebonestos Manufacturing Co., 22, Rosoman Street, London, E.C.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.
Johnson and Phillips, Ltd., Victoria Works, Old Charlton, Kent.
Matthews & Yates, Ltd., Swinton, Manchester.
Mix and Genest, Berlin, W., Germany.
Nalder Bros. & Thompson, 34, Queen Street, London, E.C.
New Gutta Percha Co., Ltd., Dashwood House, New Broad Street, E.C.
Newton Brothers, Full Street, Derby.
Phœnix Dynamo Manufacturing Co., Bradford, Yorks.
Scott, E., & Mountain, Ltd., Newcastle-on-Tyne.
Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street London, E.C.
Turner, Atherton & Co., Ltd., Denton, Manchester.
B. Weaver & Co. (see Ebonestos Manufacturing Co.), 22, Rosoman Street, Clerkenwell, London, E.C.

Engineers' Supplies.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Engines (Gas).
Campbell Gas Engine Co., Ltd., Halifax.
Cundall, Sn n & Co., Ltd., Airedale Iron Works, Shipley.

Engines (Electric Lighting).
McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Locomotive).
Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.
Hunslet Engine Co., Ltd., Leeds, England.
Hudswell Clarke & Co., Ltd., Leeds, England.
McLaren, J. & H., Midland Engine Works, Leeds.

Engines (Stationary).
Allis-Chalmers Co., 533, Salisbury House Finsbury Circus, London, E.C.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Mirrlees Watson Co., Ltd., Glasgow.

Engines (Traction).
Jno. Fowler & Co. (Leeds), Ltd., Steam Plough Works, Leeds.

Engravers.
Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Exhaust Steam Oil Separators.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Fans, Blowers.
Capel Fan Co., 13, Moseley Street, Newcastle-on-Tyne.
Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast, Ireland.
Gibbs, John & Son, 80, Juke Street, Liverpool.
Matthews & Yates, Ltd., Swinton, Manchester.

Files.
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.

Fire Bricks.
J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.

Buyers' Directory—(*Continued*).

Firewood Machinery.
A. Glover & Co., Patentees and Saw Mill Engineers, Leeds.

Fountain Pens.
Mabie, Todd & Bard, 93, Cheapside, London E.C.

Forging (Drop) Plants.
Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).
J. H. Williams & Co., Brooklyn, New York, U.S.A

Furnaces.
Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.

Gauge Glasses.
J. B. Treasure & Co., Vauxhall Road, Liverpool.
Tomey, J., & Sons, Aston, Birmingham.

Gauges (Pressure, Vacuum, and Hydraulic).
Dobbie, McInnes, Ltd., 45, Bothwell Street, Glasgow.

Gearing.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.
Angus, G. & Co., Ltd., Newcastle-on-Tyne.
Asquith, William, Ltd., Well Road Works, Halifax.
Dixon, W. F., & Co., Percival Street, C. on-M.[2] Manchester
Reid Gear Co., Linwood, near Glasgow.
Wild, M. B., & Co., Corporation Street, Birmingham.

Gold Dredging Plant.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C

Greases.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Hack Saws.
Baynes, Charles, Knuzden Brook, Blackburn.

Hammers (Steam).
Davis & Primrose, Leith Ironworks, Edinburgh.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.
See Conveying Machinery.

Horizontal Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement Pond Co., 22-25, Victoria Street London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Hydraulic Leather.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Hydraulic Machine Tools.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Vauxhall and West Hydraulic Engineering Co. Ltd., 23, College Hill, London, E.C.

Icemaking and Refrigerating Machinery.
H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

Indicators.
Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow
Hannan & Buchanan, 75, Robertson Street, Glasgow.

Iron and Steel.
Allen, Edgar, & Co. Ltd., Imperial Steel Works, Sheffield.
Askham Bros. & Wilson, Ltd., Sheffield.
Buckley, Saml., St. Paul's Square, Birmingham.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farnley Iron Co., Ltd., Leeds England
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.
Fried. Krupp, Grusonwerk, Magdeburg-Buckau, Germany.
J. Frederick Melling, 14, Park Row, Leeds, England.
Parker Foundry Co., Derby.
Purden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.

Ironwork (Constructional).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Ironwork (Galvanised).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Lagging Sheets.
Zeitz & Co., 21, Lime Street, London, E.C.

Lathes.
Asquith, William, Ltd., Well Road Works, Halifax.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Eclipse Tool Manufacturing Co., Linwood, near Glasgow.
Leckenby, Benton, & Co., Perseverance Ironworks, Halifax.
Mitchell, D., & Co., Ltd., Parsonage Works Keighley
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Lathe Carriers
Williams, J. H., & Co., Brooklyn New York, U.S.A.

Laundry Machinery.
W. Summerscales & Sons, Ltd., Engineers, Phœnix Foundry, Keighley, England.

Lifts.
Waygood & Co., Ltd., Falmouth Road, London, S.E.

Lubricants.
Blumann & Stern, Ltd., Plough Bridge, Deptford, London S.E.
Reliance Lubricating Oil Co., The, 19 & 20, Water Lane, Great Tower Street, London, E.C.

Machine Tools.
Asquith, William, Ltd., Well Road Works, Halifax.
George Addy & Co., Waverley Works, Sheffield.
Bateman's Machine Tool Co., Hunslet, Leeds.
Beanland, Perkin, & Co., School Close Works, Leeds.
Bertrams, Ltd., St. Katherine's Works, Sciennes, Edinburgh.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhine (Germany).
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.
Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Dean, Smith & Grace, Ltd., Keighley.
Dempster, Moore & Co., Ltd., 49, Robertson Street, Glasgow.
Fengl, A., & Co., Grafton Street, Altrincham.
Greenwood & Batley, Ltd., Leeds.
Jones & Lamson Machine Co., 97, Queen Victoria Street, London, E.C.
John Lang & Sons, Johnstone, near Glasgow.
Lake & Spencer, Ltd., Broadheath, Manchester.
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne.
Niles-kement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
J. Parkinson & Son, Canal Ironworks, Shipley, Yorkshire.
C. Redman & Sons, Halifax.
Resides, 12, Aire Street, Brighouse, Yorks.
Rice & Co. (Leeds), Ltd., Leeds, England.
G. F. Smith, Ltd., South Parade, Halifax.
Swift, George, Clarence Ironworks, Halifax.
Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill, Birmingham.
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.
H. W. Ward & Co., Lionel Street, Birmingham.
T. W. Ward, Albion Works, Sheffield.
West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.
Winn, Charles, & Co., St. Thomas Works, Birmingham.
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Marks.
Pryor, Edward, & Son, 68, West Street, Sheffield.

Metals.
Delta Metal Co., Ltd., East Greenwich, London, S.E.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
Phosphor Bronze Co., Ltd., Southwark, London, S.E.

Metals (Perforated).
Brown, Andrew, & Co., 110, Cannon Street, London, E.C.
Méguin, Fr., & Co., Ltd., Engineering Works, Dillingen-on-Saar.

Mining Drill Steel.
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.

Mining Machinery.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Office Appliances.
Dyson, John, & Sons, Ltd., 30, All Saints' Works, Derby.
Halden & Co., J., 8, Albert Square, Manchester.
Hall & Co., E. J., 39, Victoria Street, London, S.W.
Inglesant, T., & Sons, Ltd., Atlas House, Leicester.
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C.
Rockwell-Wabash Co. Ltd., 69, Milton Street, London, E.C.
Shannon, Ltd., Ropemaker Street, London, E.C.
Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

Oils, &c.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Oil Filters and Cabinets.
Valor Co., Ltd., Rocky Lane, Aston Cross, Birmingham.

Packing.
Beldam Packing & Rubber Co., 93-94, Gracechurch Street, London, E.C.
Lancaster & Tonge, Ltd., Pendleton, Manchester.
Redfern & Co., S. Swan Lane, New Brown Street, Manchester.
Quaker City Rubber Co., Coronation House, Lloyd's Avenue, E.C.
United States Metallic Packing Co., Ltd., Bradford.

Paper.
Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W.C.

Patent Agent.
Lorrain, J. G., M.I.E.E., M.I.Mech.E., Norfolk House, Norfolk Street, Strand, London, W.C.

Pumping Machinery

FOR WATERWORKS AND MINES.

Official

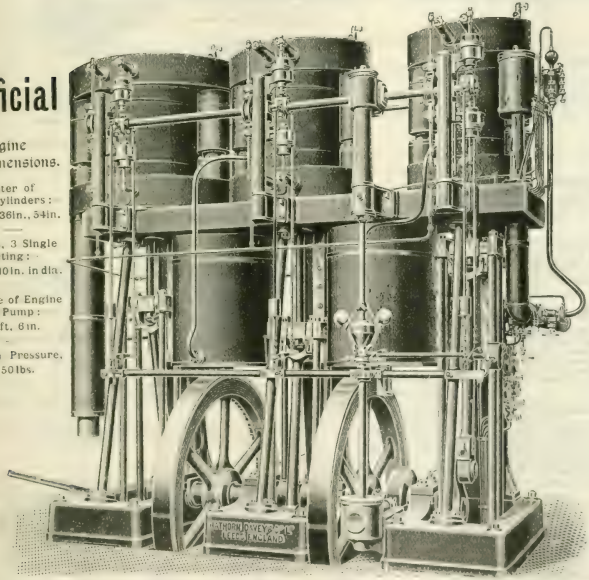
Engine Dimensions.

Diameter of Cylinders:- 20in., 36in., 54in.

Rams, 3 Single Acting:- Each 30in. in dia.

Stroke of Engine and Pump:- 3ft. 6in.

Steam Pressure, 150lbs.



Trial.

Engine Results.

Pump Horse Power:- 274·55.

Saturated Steam per Indicated Horse Power per hour:- 12·4 lbs.

Mechanical Efficiency:- 92·8 per cent.

Contract Duty to raise 6,240 Gallons of sewage per minute 125 feet high.

Triple Expansion Sewage Pumping Engine, Melbourne and Metropolitan Board of Works.

HATHORN, DAVEY & CO., LIMITED.

ABC 4th Edition
Universal Mining Code

LEEDS, England.

Telegrams:
HATHORN, LEEDS

Buyers' Directory—(*Continued*).

Photo Copying Frames.
J. Halden & Co., 8, Albert Square, Manchester.
B. J. Hall & Co., 30, Victoria Street, London, S.W.

Photographic Apparatus.
Marion & Co., Ltd., 22 and 23, Soho Square London, W.

Pinch Bars.
Samson & Co., Garforth, near Leeds.

Pipe Wrenches (Chain).
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Pistons.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Planished Sheets.
Zeitz & Co., 21, Lime Street, London, E.C.

Pneumatic Tools.
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.

Porcelain.
Gustav Richter, Charlottenburg, near Berlin, Germany.

Presses (Hydraulic).
Greenwood & Batley, Albion Works, Leeds
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Publishers.
Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
Spon, E. and F. N., 125, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.

Pulley Blocks.
Reames Ltd., Lockshook Engineering Works, Bath.

Pumps and Pumping Machinery.
Drum Engineering Co., 33, Brook Street, Bradford.
Enke, Carl, Schkeuditz-Leipzig, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
J. P. Hall & Sons, Ltd., Peterborough.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.

Radial Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Mitchell, D., & Co. Ltd., Parsonage Works, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Rails.
Wm. Firth, Ltd., Leeds

Riveted Work.
P. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham.

Roller Bearings.
Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W

Roofs.
D. Anderson & Son, Ltd., Lagan Felt Works, Belfast.
Clayton, Son & Co., Ltd., Hunslet, Leeds.
Heid, Wrightson & Co., Ltd., Thornaby-on-Tees.
McTear & Co., Ltd., Newtownards Road, Belfast.

Ropeways (Aerial).
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.
Bohlig, J., Ltd., Cologne, Germany.

Scientific Instruments.
Cambridge Scientific Instrument Co., Ltd., Cambridge.

Slotting Machines.
Swift, George, Clarence Ironworks, Halifax.

Spanners.
Williams, J. H. & Co., Brooklyn, New York, U.S.A.

Stampings.
Thomas Smith & Sons of Saltley, Ltd., Birmingham.
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stamps (Rubber).
Rubber Stamp Co., 1 & 2, Holborn Buildings, Broad Street Corner, Birmingham.

Stamps (Metal).
Edward Pryor & Son, 68, West Street, Sheffield.

Steam Traps.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.
Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

Steel Structures.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
Clayton, Son & Co., Ltd., Hunslet, Leeds.

Steel Tools.
Saml. Buckley, St. Paul's Square, Birmingham.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

Steel (Tool Steel).
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.

Stokers.
Ed. Bennis & Co., Ltd., Bolton, Lancs.

Stone Breakers.
S. Pegg & Son, Alexander Street, Leicester.

Superheaters.
A. Bolton & Co., 49, Deansgate, Manchester.

Time Recorders.
Howard Bros., 40, Paradise Street, Liverpool, and 102, Queen Victoria Street, London, E.C.

Tubes.
Thomas Piggott & Co., Ltd., Spring Hill, Birmingham.
Tubes, Ltd., Birmingham.

Turbines.
Greenwood & Batley, Albion Works, Leeds.
S. Howes Co., 64, Mark Lane, London, E.C.

Typewriters.
Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

Valves.
Holmes & Co., W. C., Huddersfield.
Hopkinson, J., & Co., Ltd., Britannia Works, Huddersfield.
Hunt & Milton, Crown Brass Works, Cozells Street North Birmingham.
Scotch and Irish Oxygen Co., Ltd., Rosehill Works, Glasgow
Shaw, Joseph, Albert Works, Huddersfield.
Wian, Charles, & Co., St. Thomas Works, Birmingham.

Ventilating Appliances.
Matthews & Yates, Ltd., Swinton, Manchester.

Water Softeners and Purifiers.
Lamm & Heal, 52, Queen Victoria Street, London, E.C.

Wagons—Steam.
Thornycroft & Co., J. I., Ltd., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

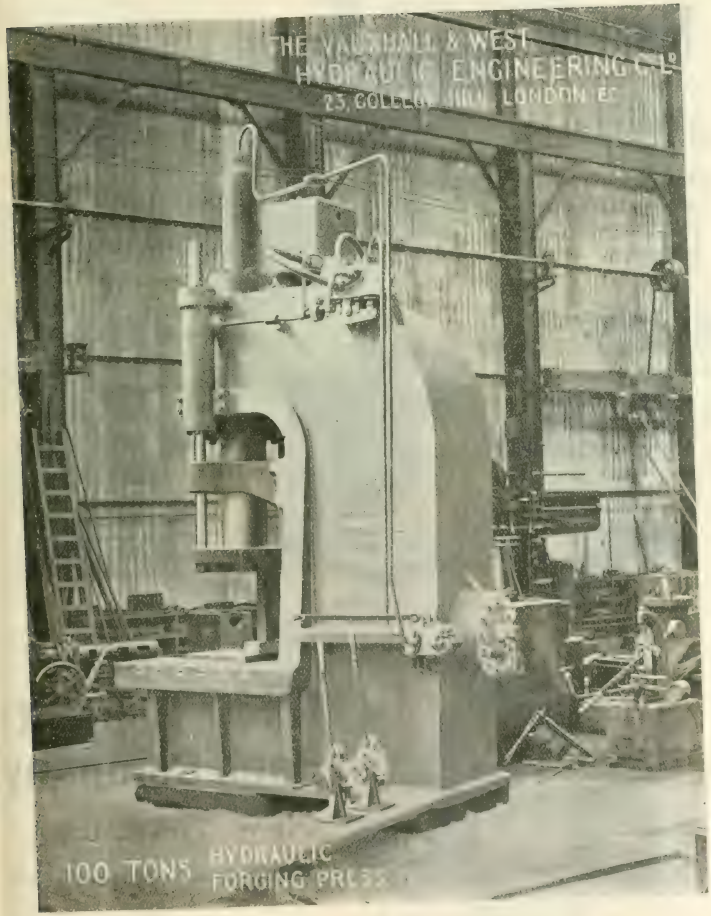
Weighing Apparatus.
W. & T. Avery, Ltd., Soho Foundry, Birmingham, England.
Samuel Denison & Son, Hunslet Moor, near Leeds.

Wells Light.
A. C. Wells & Co., 100A, Midland Road, St. Pancras, London, N.W.

Wire Working Machinery.
Ed. Brand & Co., 15, Shakespeare Street, Manchester.

"Woodite."
"Woodite" Company, Mitcham, Surrey

Hydraulic Machine Tools



PAGE'S WEEKLY — Machine Tools, &c.

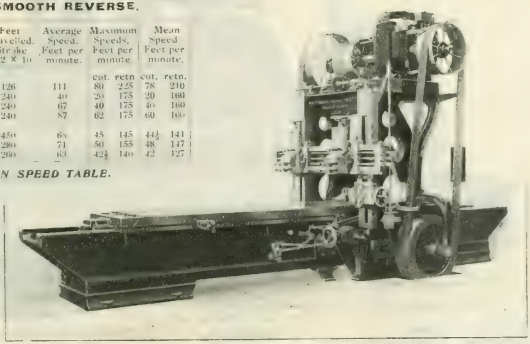
PAGE'S WEEKLY — Machine Tools

The Latest Planer Practice comprises

1. VARIABLE SPEEDS ON THE CUT.
2. CONSTANT HIGH SPEED ON THE RETURN.
3. PROMPT BUT SMOOTH REVERSE.

Size of Planer.	Length of stroke.	Time of 10 cycles.	Feet travelled. Stroke × 2 × 10	Average Speed. Feet per minute.	Maximum Speeds. Feet per minute.		Mean Speed Feet per minute.	
in. in. ft.	ft. in.	m. sec.			cut.	retn.	cut.	retn.
24 × 24 × 6	6 31	1 8	126	111	80	225	78	210
36 × 36 × 12	12 0	6 0	240	40	20	175	20	160
(With 3-speed gear box for cut).	12 0	3 34	240	67	40	175	40	160
	12 0	2 46	240	87	62	175	60	160
42 × 42 × 20	22 6	6 39	450	68	45	145	44½	141
42 × 42 × 14	14 0	3 56	280	71	50	155	48	147
60 × 60 × 12	14 0	4 8	280	68	42½	140	42	127

THE BATEMAN SPEED TABLE.



Time your planers and compare with the above speeds Then calculate what you lose yearly by using old-fashioned tools, and write to us for our Catalogue

36 in × 36 in × 12 ft patent HIGH SPEED PLANER, with Three Speeds on the cut (20, 40, and 60 ft. per min.) and constant return speed (175 ft. per min.)

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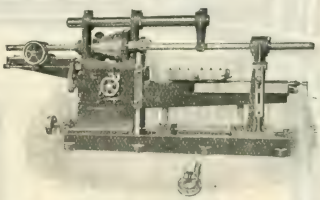
POWERFUL, DURABLE, ACCURATE.

These are essential qualifications in machines of the type illustrated. Our make complies with these requirements, and in addition embodies all the most advanced time and labour saving features.

COMBINED HORIZONTAL DRILLING, BORING, FACING, AND MILLING MACHINES . . .



Large range of speeds and feeds. Tables self-acting in all traverses. Strong and rigid for high speeds Cover a very large range, and various classes of work.

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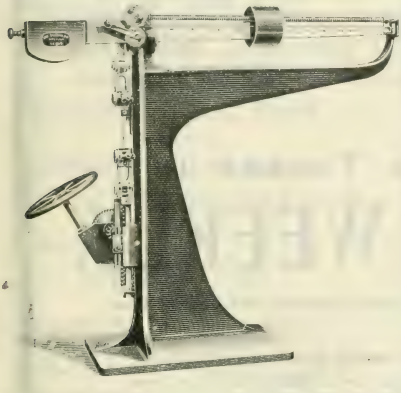
Well Road Works, HALIFAX, England.

SPECIALISTS in HIGH SPEED DRILLING and BORING MACHINES.

PAGE'S WEEKLY — Miscellaneous

Denison's SINGLE LEVER Wire Tester.



This apparatus is arranged for ascertaining the tensile strength of small wire, and is very accurate.

NO LOOSE WEIGHTS
ACCURATE EXTENSION GAUGE.

Capacity		
1,000 lbs. avoir.	(1)
1,250 " "	(2)
1,500 " "	(3)

The poise weight carries a vernier to show single pounds.

RAPID IN USE.

PATTERN B.

SAML. DENISON & SON, LTD.,

Hunslet Moor,

Telegrams: "WEIGH LEEDS." Near LEEDS.

"VALOR" PATENT WASTE OIL FILTER.

BEST AND MOST EFFECTIVE IN THE UNITED KINGDOM.

For thoroughly cleansing dirty oil so that it can be re-used.

NO CHANCE FOR ARGUMENT TO YOUR PROFIT AND ADVANTAGE.

It saves your oil. It saves your money. WHAT MORE DO YOU WANT?

Use the "Valor" Patent Oil Filter which will Repay its Initial Cost in a few weeks.

Cases Free and Carriage Paid to any Railway Station in England and Wales.

No.	To Filter persons, Approx. Gallons	Capacity. Gallons Filtered Oil.	Gallons Dirty Oil.	Height. Inches	Dia. under Handles	Price.
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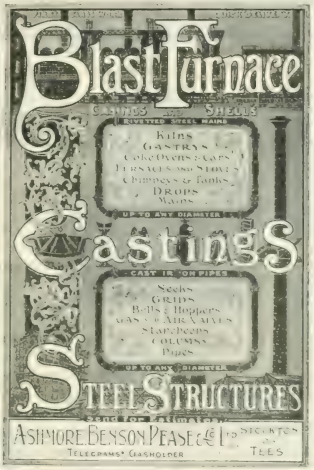
2	4 to 6	2	4	28	11	46/6
3	8 to 10	4	6	34	12	50/-
4	12 to 14	6	8	37	14	75/-
5	15 to 20	11	15	41	17	100/-
6	20 to 25	12	24	47	18	120/-

THE VALOR COMPANY, Ltd., ROCKY LANE, ASTON CROSS, BIRMINGHAM.



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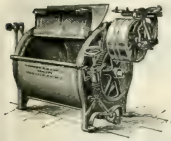
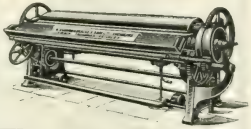


LAUNDRY

MACHINERY

and Steam COOKING APPARATUS.



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Summerscales, Ltd., KEIGHLEY, ENGLAND.

W. & O. GILMOUR,

Machine Belt Manufacturers,

St. John's Hill,

EDINBURGH.

Telegrams: "BELTING, EDINBURGH." Telephone No.: 575 Central

Belting

MADE FROM

PURE OAK TANNED LEATHER.

Quality is Our First Consideration.

For over **Eighty Years** we have been makers of Leather Belting, but owing to the present demands of trade we have just laid down extensive plant, and are now in a position to supply Oak Tanned Leather Belting at as reasonable a price as is consistent with first-class goods.

WEST PASCAGOULA CREOSOTING WORKS,

WEST PASCAGOULA, MISS., U.S.A.

Situated on Pascagoula Bay and on the line of the Louisville and Nashville Railroad. These works have been in operation for more than twenty-six years. ORDERS for Creosoted Piles, Telegraph Poles, Cross Arms, Electric Conduits, Paving Blocks, Sawed Tiles, and Timber PROMPTLY EXECUTED. New cylinders, 115 ft. long. Capacity, one million feet per month. A.B.C. Code used. Cable address: Pierre, West Pascagoula, Miss.—Address, JNO. B. LINDSEY, Superintendent.

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SAW GUARDS, BENCHES, SHARPENERS

Adopted by Governments, Corporations, Railway Companies, and Hundreds of leading Timber, Coal, Engineering, Building, & Contracting Firms at Home and Abroad.

M. GLOVER & CO., Saw Mill Engineers, **LEEDS.**

ARTHUR CORT & CO.,

CAMBERWELL, LONDON, England.

MANUFACTURERS OF

Vulcanised Fibre. **Balata & Cotton Belting.**

Gutta Percha. **Chatterton Compound.**

Telegrams: "CORT, CAMBERWELL, LONDON."

PAGE'S WEEKLY Systems for Engineers

Made-to-Order Business Systems.

Many firms, when considering the adoption of newer methods and modern systems, think they can be secured ready-made, or that what somebody else is using will meet their needs and work as smoothly for them as it does for the person whose use it was originally adapted to.

This is an error, for there are many little features in every business that it is necessary to consider, and which must be provided for, if the system is to be a success.

Thus, to be sure of your system, it must be made to order, for ready-made systems, by reason of their deficiencies, usually spell chaos, and at best are not nearly so effective as a made-to-order system. Moreover, the latter is more easily applied, because it exactly fits the business for which it is designed, and will not create trouble or confusion in making the transition from older methods that may be in use.

ROCKWELL WABASH BUSINESS SYSTEMS are made to order, a staff of trained experts giving individual attention to every system that is installed, and if you will fill in the coupon below with your name and address, and mark what subjects you are interested in, and send same to us, we will send you our Information Forms, and on the return of these, be pleased to advise you by post just what is necessary for your particular needs; or, if convenient, we will have a representative call who will discuss the matter with you without charge or other obligation.

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69, Milton Street, London, E.C.; 164, Buchanan Street, Glasgow; 50, Deansgate Arcade, Manchester.

Please have your representative call and discuss with us the subjects and systems numbered ...., or send us your Information Forms relating to same without expense or obligation to us.

Name ____________________

Address ____________________

Business ____________________

I—26

1. FACTORY COSTS
2. STORES LEDGERS
3. PERPETUAL CARD LEDGERS
4. QUOTATIONS GIVEN
5. QUOTATIONS RECEIVED
6. ADVERTISING RECORDS FOR ADVERTISERS
7. ADVERTISING RECORDS FOR AGENTS
8. ADVERTISING RECORDS FOR PUBLISHERS
9. STAFF REGISTER
10. CUSTOMER'S LISTS
11. ADDRESSING LISTS
12. FOLLOW UP SYSTEM — [illegible]
13. FOLLOW UP SYSTEM — OVERDUE ACCOUNTS
14. CREDIT RATING
15. SHAREHOLDERS REGISTER
16. FILING CATALOGUES
17. FILING CORRESPONDENCE
18. FILING INVOICES
19. PATTERN RECORDS
20. DRAWING RECORDS
21. ORDER SYSTEMS
22. DOCTORS, DENTISTS AND OCULISTS
23. MEMBERSHIP RECORDS
24. INSURANCE RECORDS FOR COMPANIES
25. INSURANCE RECORDS FOR BROKERS
26. INSURANCE RECORDS FOR AGENTS

Index to Advertisers.

Advertisements not appearing this week will be found by reference to the preceding or following issues, with the exception of those appearing monthly.

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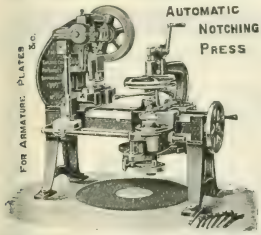
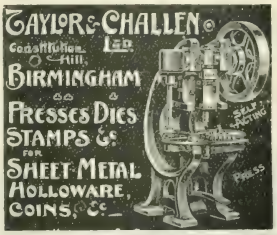
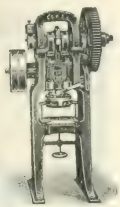
Index to Advertisers—(Contd.)

PAGE'S WEEKLY — Miscellaneous







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PAGE'S WEEKLY

Miscellaneous

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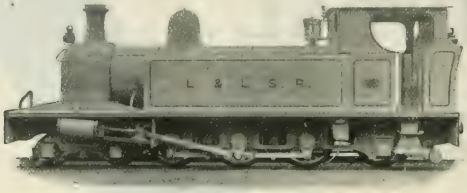
LOCOMOTIVE ENGINES,

Of all sizes and any gauge of Railway, of greatly improved Construction, for Main or Branch Railways, Contractors, Ironworks, Collieries. Prices, Photographs, and full Specifications on application.



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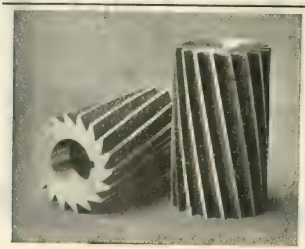

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High Speed
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Ordinary Steel.

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SOHO, BIRMINGHAM.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

VOL. VIII. LONDON, FRIDAY, JANUARY 10, 1903. No. 71

The Offices of "Page's Weekly."

Wednesday Evening.

THE report to the London County Council by their Chief Officer of Tramways, on his visit to America, is a document which, in view of the efforts which are being made to improve London traffic facilities, is both timely and instructive. Mr. Fell does something more than collect a certain quantity of facts and figures. Side by side with his notes on American practice he discusses the relative efficiency of our own methods, and the possibility or otherwise of affecting their improvement. His inspections of tramway undertakings ranged over New York, Washington, Pittsburg, Toronto, Niagara, Buffalo, Boston, Albany, and Schenectady. It appears to Mr. Fell that American engineers and their financial supporters are much more inclined than we are to take the view that where there is a main road out of a city or a possibility of connecting two cities there should be a street railway to develop the district. In many instances the undertakings do not prove a financial success for some years, but the country is being developed so rapidly that the risk is only a small one when the ultimate results are taken into consideration. In most of the smaller cities the trackwork is of the cheapest possible character and apparently this is all that is required until the undertaking is in a position to instal the work in a more permanent manner. It does not, however, follow that the track in important cities is satisfactorily maintained. The condition of the paving in some of the cities visited is described as disgraceful, and, adds Mr. Fell, it would not be tolerated in this country. This point should be taken into consideration when comparing the operating costs with those of similar undertakings in London. Apparently

A. L. A. FELL, M.I.E.E.

Chief Officer of Tramways to the London County Council.

His instructive report on American tramways, based upon a tour in the States, is dealt with in the accompanying pages. Mr. Fell's paper on Brakes read before the Tramways and Light Railways Association last week is also summarised in this issue. (See pages 128 and 130.)

the conduit system is only in operation in two cities in America, viz., in New York and in Washington.

Mr. Fell says he considers that the cost of cleaning out the conduits would be enormously reduced if alternate large insulator manholes could be provided in London. To facilitate the work, a small sump, not necessarily connected to the sewer, should be provided opposite each of these manholes. Large sumps connected to the sewer every 40 yards or so, should also be provided. Although the cost of construction might be very slightly increased if this method were adopted, the cost of conduit cleaning would be very much reduced, as a greater proportion of the work could be done during the day instead of at night as under present conditions, and in all probability the large quantities of water used at present would not be necessary. Insulator box covers might possibly be abolished if large manholes were placed midway between insulators at a distance of 31½ ft. as suggested. In Toronto one of the most notable points of interest considered appears to have been the use of the card system. All materials required for the undertaking are dealt with from a central store, and then booked out to sub-stores at the various depots. The whole of the materials and goods received are entered in and out on the card-filing system; by this means a very accurate record is kept, and stock-taking is a very simple matter.

The traffic arrangements at the Sullivan Square terminal station, Boston are voted excellent, and it is remarked that they solve the problem as to how best to do away with the disadvantages of "dead end" lines. Mr. Fell thinks it may be possible to provide a somewhat similar station in the neighbourhood of some of the "dead end" termini of the Council's lines, where there is no prospect of making a through connection. The shortest headway between trains from the termini is a train every two minutes. Ten trains pass the signal boxes or towers every six minutes during shortest headway. During rush hours thirty-four car trains are in service at a time without causing delays at termini or junctions. Trains consist of three cars during light hours and four cars during heavy hours, the rear car always being reserved for smokers. The average daily car mileage is 20,000. An average of over 100,000 passengers are accommodated at each terminal every day, and about 60,000 each at Boylston Street and Park Street stations. During the evening rush hours an average of over 8,500 passengers per hour arrive at each terminus by train. The wear on rails has been extremely severe on some of the sharp curves, but manganese steel has recently been used with good results.

Mr. Fell describes the visit which he paid to the extensive works of the General Electric Company at Schenectady. The magnitude of the works, he says, may be judged by the fact that no less than 11,500 hands are employed in these works and the buildings cover an area of over 300 acres. Here, as in the works of the Westinghouse Company, he found that the general tendency is to increase the size of the motors used for traction work, and everything possible is being done to increase the life of this, the most important and most expensive portion of the equipment of an electric car. In addition to the work in the traction department, he made a very careful study of the Curtis turbine (which is manufactured by the General Electric Company) in course of construction, and was very much struck by the great care which is exercised in the manufacture of these machines. In another part of the report it is noted that the platforms on the Council's Holborn and Aldwych subway are much narrower than those provided in New York. It will, therefore, be necessary to have very definite regulations as to the entrances and exits from the stations, so that the two streams of passengers will not meet. In New

York the regulation of the passengers entering and leaving the cars, both on the elevated and the subway lines, is very bad, but in connection with the street cars Mr. Fell noticed that the passengers assisted the service very much by getting on and off the cars as quickly as possible, and he thinks our London passengers could help matters in this respect. "In Boston the elevated street and subway cars are operated together. The elevated cars run in the subway and *vice versa*. The street cars are also run through the subway, but not on the elevated lines. The conditions of traffic in the Boston subways are typical of the conditions which may be expected in the Aldwych to Holborn subway, as both street and special subway-cars are run over the lines, but as the single-deck cars in London will have to run through to the outside districts *via* some of the existing curves which are very sharp, and the cars cannot be built more than 33 ft. 6 in. long over all, by 6 ft. 10 in. wide, whereas some of the Boston cars are nearly 50 ft. long by 8 ft. 9½ in. wide. The London cars will consequently only seat thirty-six passengers, whereas the large Boston cars seat sixty passengers, and in the latter vehicles provision is made so that a very large number of passengers can stand up in the centre gangway. This, in London, would be against the Police Regulations, as no passengers are allowed to stand in any car.

"In Boston the method of dealing with the passengers on the elevated and subway lines is much more satisfactory than in New York. A definite regulation is in force that passengers can enter a car at both ends, but they have to leave by a special door in the centre of the car. The front, rear, and centre doors of the cars are all operated by compressed air. The doors all slide longitudinally and the edge of each door is fitted with an inflated rubber tube, so that in the event of a passenger getting a hand caught in the door when it is being closed no damage is done." "I am afraid," adds Mr. Fell, "that the cars in the Council's subway will be too short to give sufficient space for a centre door, but I propose with the permission of the Board of Trade, to arrange for all passengers to leave the cars by the rear platform as at present, but enter the car by the front platform, the open entrance and exit being on the near side of the car only. I have so designed the cars that this object can be accomplished without interfering with the duties of the motormen."

Mr. Fell devotes some attention to the training of motormen, showing that our own arrangements in this direction are capable of improvement. He describes and illustrates a model repair shop for cars, which he has designed for London on the experience gained in the various shops visited, and remarks that it is most important that a permanent repair shop should be obtained as soon as possible, as the temporary premises at New Cross will shortly be quite inadequate for the requirements of the department.

It is interesting to note that the engineers in both New York and Washington admit that there is room for improvement in their ploughs. "I certainly think," says Mr. Fell, "that it would reduce their cost of upkeep appreciably if they adopted the Council's hard base rubber plough, which gives most satisfactory results in all weathers. After a careful examination of the ploughs obtained during my visit, I am of opinion that it would be false economy to substitute a cheaper form of plough for that now in use in London, as so much depends on the proper working of the plough. A cheap plough will not only be an expensive item with regard to upkeep, but it may cause serious delays in the traffic and heavy loss would be entailed."

On the subject of motors he says, "the size of the motors now in use on most of the American tramways has been increased, the smaller types being abolished and replaced by motors of from 40 to 75 h.p. Much more rapid acceleration

is provided, and the resistances are so well arranged that full speed is attained in a very short distance without unduly jerking the car when starting. Many new features have been recently introduced into the design of the tramway motors. I have as far as possible included these improvements in the specification for the new cars, and have also called for larger motors, so that the increased speeds sanctioned by the Board of Trade may be obtained, and no difficulty will be experienced on the gradients on the lines now being constructed."

Various other details receive careful consideration. The results obtained with the momentum form of brake are, it is understood, very satisfactory, and as the makers have offered to submit a sample for trial on the Council's cars free of charge, Mr. Fell proposes to carefully test it, and also the sample air brake equipments, which have been submitted, so that the committee may compare the results with those obtained with the magnetic track brakes and ordinary brakes, which he tested and reported on very fully a short time ago. The concluding section deals with the single-phase system of traction. It is remarked that up to the present time the single-phase system has not been used in connection with conduit tramways. "It would not be possible to use a very high pressure system on a conduit system, as the insulation of the conductor tees could not be made sufficiently high, but I feel certain that with the rapid developments which are now taking place with the single-phase systems, which a few years ago was considered almost an impracticable one; railways, light railways, and tramways will be equipped on this system. As a potential of from 2,000 to 3,000 volts is used on the single-phase system, and the motors are generally wound for from 200 to 600 volts, it is necessary to have a small transformer on the car to make the necessary reduction in voltage; this transformer is generally provided with short-circuiting connections leading from the coils at various points to switches operated by a master controller; by means of these connections the necessary variations in speed can be obtained without difficulty and without loss of efficiency, as no resistances similar to those in a direct-current system are necessary."

Some men are born to punctuality; others have it thrust upon them, but few employees can say with C. Jennings, one of Messrs. M. Glover and Company's employees, "I have not been once late during the past year." A Leeds paper chronicles the fact that nobody else in the works claimed the distinction, and Jennings was very properly presented with a nice little memento of the occasion. Not even good resolutions will pave the way to a faultless time-sheet, though many are doubtless made on New Year's Day. The case of Jennings points a moral concerning the question of overtime, which our contemporary puts in a nutshell thus:—"It may be suggested that this man had only worked about one hundred hours overtime during the whole year, whereas several others had worked overtime much more frequently, but does not this show how doubtful the advantage of working overtime at all is, both for man and masters, for where is there anything but disadvantage in habitually working an hour or two extra at night and losing time in a morning? It certainly does not at all follow that the man who often works overtime does the most work or the best work, or works the greater number of hours in a year." Euclid tells us that things which are equal to the same thing are equal to one another, but it cannot be expected that an hour's overtime will ever be equal to an hour lost in the morning. In point of fact they are *not* the same thing. A little less encouragement of overtime and a little more insistance upon punctuality would give us more Jennings and an improvement valuable alike to employers and employed.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

DAVIDGE PAGE, Editor.

Clun House, Surrey Street, Strand, London, W.C.
Telephone No. [illegible]349 GERRARD.
Telegraphic and Cable Address: "SINEWY, LONDON."

Correspondence *is invited from any person upon subjects of interest to the engineering community. In all cases this must be accompanied by full name and address of the writer, not necessarily for publication but as a proof of good faith. No notice whatever can be taken of anonymous communications.*

The Editor does not hold himself responsible for the opinions expressed by individual contributors, nor does he necessarily identify himself with their views.

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New Copy for Advertisements,

Alterations, &c., intended for insertion in the current week's issue must be delivered **not later than 4 p.m. on Monday.** If proofs are required the copy and blocks should reach us several days earlier.

MEETINGS, ETC., FOR THE ENSUING WEEK.

FRIDAY, JAN. 19.—Institution of Mechanical Engineers, Storey's Gate 8 p.m. Re[illegible]ed [illegible] on paper "Behaviour of materials under [illegible]" Mr. R. A. Fra[illegible], "Worm Contact." Royal Institution, 9 p.m. Professor J. J. Thomson, "Some Applications of the Theory of Electric Discharge to Spectroscopy." North-East Coast Institute of Engineers and Shipbuilders, Westgate-road, Newcastle-on-Tyne, 7.30 p.m. Mr. J. M. Mon[illegible], "Commercial Dry Docks."

TUESDAY, JAN. 23.—Institution of Civil Engineers, Great George Street, S.W., 8 p.m.

WEDNESDAY, JAN. 2[illegible].—Society of Arts, 8 p.m.

THURSDAY, JAN. [illegible].—Institution of Electrical Engineers, Great George Street, S.W., 8 p.m. Society of Arts Howard Lecture, 8 p.m. Professor S. P. Thompson on "High Speed Generators, [illegible] reference to Turbines." Royal Society, Burlington House, 4.30 p.m.

FRIDAY, JAN. 26.—The Junior Institution of Engineers, the Westminster Palace Hotel, 8 p.m. Honorary Member's Lecture of the 25th Session, "Notes on Boiler Trials," by Professor J. D. Cormack, B.Sc.

NEWS ITEMS.

The Baker-street and Waterloo line is rapidly nearing completion. At the present time the Underground Electric Railways Company of London has something like twenty-seven miles of line under construction.

At Johannesburg the Chamber of Mines has issued a memorandum setting forth the dependence of the gold industry on Chinese labour and the consequences which would ensue from arresting its importation.

Messrs. Andrew Brown and Co., 110, Cannon-street, E.C., have been appointed the London and district agents for Messrs. Vaughan and Son, Ltd., West Gorton, Manchester, makers of electrical cranes.

The engineers to the Panama Canal are now recommending the employment of Chinese labour.

The British Admiralty is to be represented by one or more ships at the celebration of the American tercentenary in 1907.

We are glad to announce that Sir Richard Tangye, who recently underwent a surgical operation, is making satisfactory progress towards recovery.

The Admiralty have decided to go on with the installation of electric light and the erection of a power station in Sheerness Dockyard. The work was stopped a few months since, but is now to be pressed forward without delay.

Board of Trade returns just issued show that there was little change in the labour market during December, as compared with the previous month. Compared with a year ago, employment in nearly all the principal trades showed a considerable improvement.

CONTENTS.

New Chemical Fire Engine for the Admiralty.

For service at Gibraltar Dockyard, Messrs. Shand, Mason and Co. have recently constructed a new and improved form of double-cylinder chemical fire engine, designed to rapidly convey to the scene of a fire a complete chemical extinguishing apparatus with sufficient men to deal with an outbreak in its early stages.

The chemical apparatus is based upon the well-known principle of obtaining by the combination of chemicals the instant generation of a powerful pressure of carbonic acid gas, which expels the mixture of gas and water with great force upon the fire.

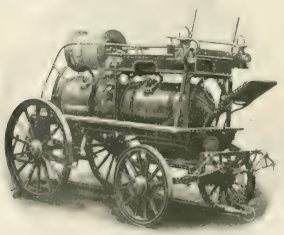
The two cylinders which form the receptacles for the water and chemicals are of hammered copper, capable of withstanding very high pressures. Each is well tinned inside and furnished with gun-metal fittings; it is put under pressure by means of the bow handle and spindle, the movement of which withdraws the plug of the acid vessel and overturns the acid into the alkaline solution. Each cylinder has two outlets, one for the direct attachment of hose, and the other communicating by means of a copper tube with the hollow axis of the hose reel at rear. The two cylinders, which can be used either consecutively or together, have a capacity of 50 gallons each, and will each give a strong jet of ten to thirteen minutes' duration, according to the size of jet used.

The carriage of the machine is strongly built on the lines of the firm's latest pair-horse hose carriage, the cylinders taking the position occupied by the large hose-box. Above the cylinders is a shallow box for hose, etc., the top of the box forming seats for the coachman and fireman. At the rear there is a foot-plate for a fireman, and for the ladders to contain spare acid bottles and alkali canisters. The machine is mounted on strong, wood-spoked wheels, steel mail-coach axles and steel springs, etc., a powerful double lever brake acting on both hind wheels.

As, at Gibraltar, it will be an advantage in many cases to convey the engine from one part to another by rail, Messrs. Shand, Mason and Co. have supplied a specially designed railway trolley, arranged to allow of the machine being rapidly mounted and dismounted.

In addition to the chemical engine, for service at more serious fires in the dockyard the firm have constructed a powerful steam fire engine of their "Double Vertical" variable expansion type, similar to those lately built for the London Fire Brigade, the steamer being provided with similar railway trolley to that for the chemical engine.

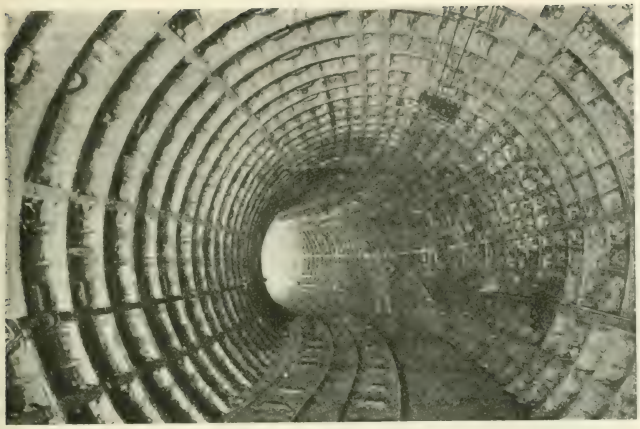
The double-cylinder chemical engine, as illustrated, is well adapted for general fire brigade purposes, but for use where a separate vehicle is not desired, a combined machine has been constructed and supplied to several fire brigades, in which the second chemical cylinder is replaced by a hose-box and the carriage is adapted to carry a lattice girder fire escape. By the use of this machine the life-saving apparatus, chemical engine, and hose, etc., are kept in readiness for instant turn-out on the first alarm, and with men mounted, the whole can be rapidly drawn to the scene of an outbreak by the one pair of horses that would be necessary for the hose carriage alone.



CHEMICAL FIRE ENGINE FOR GIBRALTAR DOCKYARD.

Dock Improvements at Liverpool.

Presiding at the recent annual meeting of the Mersey Docks and Harbour Board, Mr. Robert Gladstone was able to report a number of improvements in progress and in contemplation. At the north end of the estate is the Hornby Dock; the site is now ready for carrying out a scheme for dock extension which will be submitted to Parliament during the coming session. The first step will be to make two new entrances into the river each 135 ft. wide. There will be a vestibule dock, out of which two others will open, accommodating steamers of a length of 800 ft., and possibly 850 ft. These entrances will also serve for a still larger extension northward at some future period. This extension has been rendered necessary by the great increase in the trade of the port, and particularly by the increase of the size of steamers. The entrance to the graving docks and basins at Tranmere, on the Birkenhead side of the river, are now nearly complete, and the construction of the river wall is well advanced. The adjoining docks and land covering an area of nearly 90 acres are being prepared by the Tranmere Bay Development Company for shipbuilding purposes.



TUNNEL CURVE OF 150 FT. RADIUS.

Driven by hydraulic shields under compressed air at New York.

Improvements are being carried out at the floating bridges to strengthen them for the passing of motors and vehicles up to 12 tons. It is proposed to make a new dock at the Victoria Wharf, Birkenhead, with an area of 11 acres. The dredging at the bar and sea channels has been continued, 92,600,000 tons of sand having been removed since 1890. The depth is now 27 ft. at low-water spring tides. It is hoped that the new dock offices will be completed by December next. The Chairman also mentioned that submarine signalling trials have been made at the North-West Lightship, and vessels fitted with receivers have heard the bell at a distance of from four to eight and a-half miles. The board are making inquiries as to adopting this system permanently. The probable cost of the contemplated [illegible] and it will take seven or eight years before they are completed.

A Sharp Tunnel Curve.

The striking photograph on this page for which we are indebted to the Scientific American illustrates a notable curve which has just been completed in connection with the scheme of tunnels linking up Jersey City traction systems with New York. The system at present being built comprises [illegible] track tunnel [illegible] separate [illegible]

According to our contemporary it had been freely predicted that it would be impossible to "preserve" correct alignment when using the shield method on a curve of such sharp radius as that illustrated, and the chief engineer, Mr. Charles M. Jacobs, and his staff of assistants in charge of the work, are to be congratulated upon the fact that the two tunnels driven on two concentric arcs of circles, although there was no direct communication between the two, were maintained in such exact alignment, that there was practically no variation in the distance between their centres throughout the whole sweep of the curve. The construction of these curves, needless to say, involved some nice instrumental work.

The late Prof. Sprengel.

The death is announced, in London, of Professor Hermann Johann Phillipp Sprengel, the well-known chemist and physicist. The deceased, who was born near Hanover in 1834, was educated at the Universities of Gottingen and Heidelberg, taking his degree of Ph.D. when he was 24. He came to England in the following year, and engaged in research work with the Professor of Chemistry at Oxford. He subsequently settled in London, and for two years pursued his researches at the Royal College of Chemistry, Guy's, and St. Bartholomew's Hospitals. He was created a

Fellow of the Royal Society in 18-8, and Royal Prussian Professor, 1893. Deceased was the author of a number of technical and scientific works.

Graham, Morton and Co.

We are officially informed that the firm of Graham Morton, Ltd., went into voluntary liquidation on December 27th, 1905, and that Mr. Maurice Graham, the founder and managing director of that firm, has decided to commence in the same line of business for himself, as a private concern, under the title of "Graham, Morton and Co., Pepper-road, Hunslet, Leeds."

The liquidation was accounted for largely by the great engineering law case against the Compagnie L'Union des Gaz, Milan, whereby the plaintiffs (Graham, Morton and Co., Ltd.), sued for £5,483, and the defendants counterclaimed for the sum of £70,000.

The plaintiffs in the case obtained the verdict, given by Mr. Justice Grantham, a lengthy extract of which appeared at the time in these columns. In spite of their success, this remarkable law-suit caused the complete disorganisation of the business of Graham, Morton and Co., Ltd., and indirectly cost over £30,000.

As our readers will remember, the original company was founded in 1898, to carry on the business of engineers and contractors, principally for coal, coke, and other elevating and conveying machinery, inclined retort-settings, and steel structural work. A reconstruction was effected in June last, but the capital necessary to carry on the business was not subscribed by the shareholders, and a resolution was passed at a recent meeting, voluntarily winding up the concern and appointing Mr. Robert Hilditch, liquidator. We wish Mr. Maurice Graham every success in his new venture.

Improvements at Leghorn Harbour.

Signor Salvatore Orlando, one of the deputies for Leghorn, has submitted to the Royal Commission on Italian Ports a scheme for the improvement of the port of Leghorn. The scheme provides for a thorough reorganisation, for carrying out excavations with a view to deepening the harbour, and for the construction of a large dock on the west. The enlargement of the port is said to be urgently needed, Leghorn being very poorly provided with quays; the annual tonnage of shipping amounts to about 1,100 tons for every metre of quays, while in other ports it [illegible] only between 400 and 500 tons.

New Port at Bahia Blanca.

A Bill has been laid before the Argentine Congress respecting the construction of a port at Bahia Blanca. According to the terms of this Bill, tenders will be invited for the construction of a port 9·14 meters deep, fitted with the most modern appliances for the rapid loading of vessels. The cost of the works, including the preliminary surveys and dredging plant, must not exceed 10,000,000 gold dollars (about £2,000,000). The works may be divided into two sections, to form the object of two separate contracts, for 6,000,000 dols. and 4,000,000 dols. respectively. All materials for the works will be admitted duty free. When submitting plans and estimates for the works, the tenderer must also submit estimates for the construction and working of cranes for loading and unloading grain and coal. These will be worked by the successful tenderer for the term of twenty-five years; at the end of this period they will become the property of the State.

Proposed New Steamship Line.

The South Wales News says it is understood that the local promoters of the proposed new steamship line between this country and the Colonies have received tenders from several of the leading shipbuilding firms in the country for the construction of three or four turbine liners, and that these tenders are now under consideration. The scheme, it now transpires, is receiving the support of two or three of the most wealthy and influential gentlemen in South Wales, and there is reason to believe that one of its main purposes is the development of the import trade of Cardiff.

On Friday last Messrs. W. Doxford and Sons, Ltd. Pallion, launched a well modelled turret steamer, 350 ft. in length, 51 ft. in breadth, and 26½ ft. in moulded depth, built to the order of Messrs. J. Mathias and Sons, Cardiff. She is a sister ship to the s.s. *Carthusian*, which Messrs. Doxford completed for the same owners a month ago, and is a duplicate of a large number of turrets Messrs. Doxford have recently built. The boat launched on Friday is named the *Breconian*, and is capable of carrying 6,800 tons of cargo and bunker coal on a draft of 22 ft. The classification is with the Bureau Veritas Registry and the builders are supplying the engines and boilers.

The Chain Belt Engineering Company, Derby, have recently completed for the Bethnal Green Borough Council the erection of a complete refuse sorting, elevating, and screening plant for dealing with the whole of the house refuse of Bethnal Green.

TECHNICAL SOCIETY NOTES.

THE discussion on Mr. Patchell's paper, raising points in connection with central station practice, was concluded at the meeting of the Institution of Electrical Engineers, held on Thursday last. There was again a large attendance to discuss a paper of great practical interest. Mr. H. A. Fynn, in referring to the destruction of the armature insulation of high tension alternators, was inclined to agree with Mr. Patchell, who is of opinion that the impurity of the insulating materials is the real explanation. Then the discussion came down from high science to mere commercialism. Mr. Campbell Swinton made a protest against the practice adopted by Mr. Patchell's company when ordering plant, of giving the preference to foreign manufacturers, a course of action which he stigmatised as evidencing a great lack of courage on the part of those responsible for the Charing Cross Co.'s Bow Works.

When Mr. Shaw rose to take part in the discussion, it was to point out that, while it had been said that a periodicity of 25 cycles per second was not suitable for a lighting plant, such a periodicity had been successfully employed at one of the Niagara power stations, which had mainly a lighting load to deal with. Mr. D. E. Wilson raised some fresh points on what had been the popular subject for discussion in connection with Mr. Patchell's paper, the boiler house. He said that one great difficulty which confronted boiler makers was in connection with the design of the grate, a statement with which it was easy to see that Mr. Booth agreed. With regard to the fact paraded in the paper that a pair of Upright boilers had been steamed at the rate of 100,000 lbs. per hour, boiler makers were beginning to think that it was undesirable to steam boilers at that rate. Mr. J. F. Walker complained that Mr. Patchell made his boilers perform various subsidiary functions outside their proper work of steam generation. He also wanted the author to give further figures with a view of enabling comparisons to be made between his results and those obtained at stations where turbine machinery and mechanical stokers were employed.

Mr. Duddell then described some tests he had made for Mr. Sparks in connection with the switching problem. It will be remembered that Mr. Duddell conducted a similar series of experiments for Mr. Patchell. It was then shown that any sudden change of voltage on the cable, or of current through the machine, will tend to set up oscillations whose amplitude will be the greater the less the losses in the system, so that any sudden changes in P.D. or current, especially when a cable is on open circuit, are dangerous. Thus it is dangerous to switch on an unloaded feeder or to switch off, or remove by a fuse, a very heavy load or short circuit, if by so doing any unloaded or lightly-loaded feeder is left connected to the generator. The research carried out for Mr. Sparks was confirmatory of the results noted in the Bow experiments.

In replying on the discussion, Mr. Patchell expressed his regret that the subject of surges had not played a more important part in the discussion. He went on to state his willingness to give a great deal of additional information, but did not, as a matter of fact, by any means satisfy the wants of those who had asked for more figures. He told the meeting that the cost of coal at Bow was about 13s. per ton, delivered. The load factor for the seven months' working in 1902 was 7·85 pounds of coal per unit, using large coal 4·17. In 1903, when there was a full year's working, the load factor improved to 10·66, and the consumption of coal per unit, large coal still being used, declined to 3·46 lb. In 1904 the load factor was 13·4, with a further decrease in pounds of coal per unit to 3·30 lbs., mixed coal being used during that year, while for last year, when small coal was almost entirely used, with a load factor of 13·69, the coal per unit was 3·58 lb. Mr. Patchell explained that in dealing with units and coal consumption, that he was referring to units delivered in the trunks, and not units generated in the mains. He challenged comparison with the best results achieved elsewhere, notably Berlin, which, with a large load factor, showed a consumption of 3·1 lb. of coal per unit. This, he stated, was the lowest coal consumption per unit on the Continent.

On the other points raised Mr. Patchell defended the use of foreign made machinery, by insisting that under the circumstances his company could afford to take no risks, although he was careful to explain that

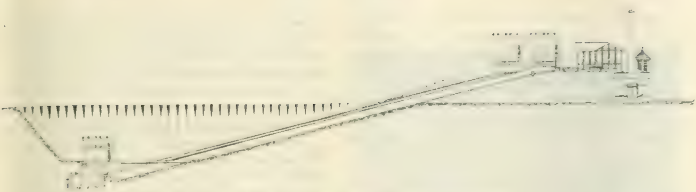
the Continent. He showed that perhaps his experience with mechanical stokers had been unfortunate, but at all events he still hoped to find a mechanical stoker which would give better results than hand firing, and when the load became lighter, he proposed to resume experiments in that direction. Certainly those who took part in the discussion favoured the use of mechanical stokers. Mr. Patchell referred to questions raised as to the most suitable periodicity for such a station, but the practice adopted at Bow was that which had been recommended by the Engineering Standards Committee, and he believed that the 50 cycles was most suitable for the work. Generally speaking, he would ask critics to remember that there had been developments in central station work since the Bow station was designed, and he implied that certain things might be done somewhat differently to-day.

There was an interesting discussion at the meeting of the Tramways and Light Railways Association on Mr. Fell's paper dealing with "Brakes," reported in this issue. Sir William Preece said that the experiments conducted by the London County Council engineers had fully demonstrated the efficiency of the electro-magnetic type of brake, but perhaps the most interesting contribution to the discussion was that made by Mr. Baldwin., who, dealing with type A and type B, electro-magnetic brakes, questioned the assertion that the wear between the pinion and gear-wheels is one of the items which must be taken into consideration when considering the maintenance. He claims that during the period of application of the brake, there is practically no wear between pinion and gear. In this respect type B is held to be easier on the gears and pinions than if the hand-brake were used, since with the hand-brake it is necessary to check through the gears the stored-up energy of the armatures, which by calculation amounts to nearly 7 per cent. of the total kinetic energy of the moving car. Carrying the point further, he pointed out that with the B type of brake the total retardation of the car would be approximately as follows :—Work done between brake blocks and wheels, 54 per cent.; work done between magnets and track, 35 per cent.; loss in rheostats, 5 per cent.; car friction, 3 per cent.; motor friction, 1½ per cent.; electrical loss in motor, 1½ per cent. It is perfectly evident, says Mr. Baldwin, that omitting the moving friction of the car, the only two points of the application of the brake are on the track through the brake magnets and on the car wheels through the brake blocks; and, assuming the magnets of both types of brake have the same pull on the rail then the type A and the type B brakes should be able to give exactly the same amount of retardation at the same speeds.

Regarding the cost of maintenance of the two brakes the connecting levers between the magnets and the brake beams are generally speaking of the same material and general construction as the brake rods and levers which are to be found on all tramcars, and the wear and tear of parts of this description are not difficult to estimate. Mr. Worby Beaumont raised an important point, being anxious to know whether any test, were carried out at higher speeds than the 15 miles per hour mentioned in the paper. Professor W. E. Ayrton suggested that more information might be given as to the amount of rubbing surfaces in contact, while Mr. H. M. Savers said it occurred to him that with magnetic brakes, the wear on the rails was bound to be very heavy, while the first cost was considerable, probably about £70 per car, which formed a very high percentage of the entire cost. On the subject of rail corrugation, he believed that it was frequently started by the skidding of braked wheels. Mr. W. Clough said that on the subject of first cost, he did not think that ought to weigh very much with tramway authorities. He had experimented at Bury with magnetic brakes, and he had not had to spend a single shilling on the extra working parts of type B, in comparison with type A in two years. On the whole an excellent case appears to have been made out for the electro-magnetic brake.

Before the Birmingham Association of Mechanical Engineers, Mr. T. H. Dacres has just delivered his presidential address, the subject being "Mechanical Training." Mr. Dacres pointed out the advantages possessed by the rising generation in the facilities given for technical education, and urged that no opportunity of further extending knowledge by the perusal of scientific journals and trade catalogues should be neglected. He also suggested that a system of encouraging suggestions as to improvements in machines and methods from workmen and foremen might be more widely adopted, to the mutual benefit of employer and employed.

The Dundee Institute of Engineers have a practical-looking programme for the remainder of the session. They have already discussed boiler mountings, and the driving of a jute mill, and forthcoming meetings will deal with live subjects, such as suction gas and gas engines, motor traction, and a comparison of different types of steam boilers. By the way, the Institute has just appointed Mr. Alex. Alexander, secretary, and treasurer.



[illegible] ON GRAND [illegible] CANAL.

THE FUTURE OF OUR CANALS.

[illegible]

HOLLAND.

It [illegible] the whole Dutch community would be largely in pocket if the companies were to spend capital in [illegible] Robinson, the British Consul at Amsterdam, reports that the building of this canal has had a very favourable influence upon the prosperity of the port. The total tonnage of Rhine and other traffic using the canal [illegible] arried out at the expense of the competing railways, as, on the contrary, the quantities of goods reaching and leaving Antwerp by railway also show an increase.

The net result of a careful study of the Continental traffic systems is fairly claimed by Mr. Arthur Lee, who recently read a paper on the subject before the Society of Arts, as proving that both canals and railways are necessities, and that increase of traffic on the [illegible] Germany, after the advent of railways, seem to have [illegible] during recent years, have expended many millions of capital to bring their ancient waterways abreast of modern conditions. Holland, which was so admirably served in the matter of waterways that private capital could not be found to build railways to compete with them, [illegible] railways must be built, and equipped, even to the extent of providing them in great measure at the cost of the State.

ENGLISH CANALS.

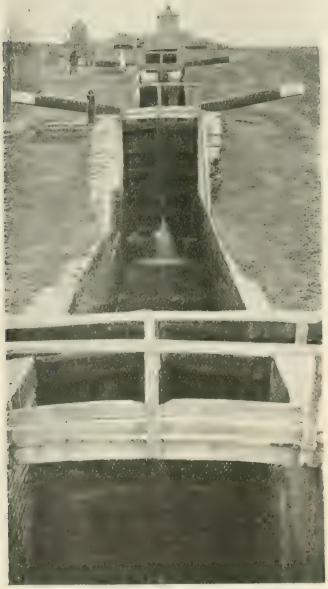
Here we are still discussing the question of what to do with our canals, and have not yet arrived at any practical conclusion. It is admitted that the conditions under which trade is carried on in this country may make a Continental analogy misleading, but it is not the case that the conditions are so different that we can afford to altogether disregard the experience of our neighbours and competitors.

The attitude of the railway companies increases the difficulties of solving the canal problem. While railway companies are determined to secure traffic even at a loss the improvement of our waterways is likely to stand still. Capital is not likely to be attracted when it is known that expenditure is likely to be made unremunerative by such competition. That is why it should be recognised at the outset that with the canal question is bound up the problem of railway rates.

AIRE AND CALDER NAVIGATION.

[illegible] becomes necessary to consider the improvements which may be brought about in the handling of traffic. In this connection it will be of interest to give a brief account of what has been done by the management of those British canal systems which have moved well with the times. These include the Aire and [illegible] premier place among British inland waterways, and is [illegible]

canals. The length of the main route is 41 miles, and there are branches including lengths of old navigation totalling another 40 miles. The locks are about 200 ft. long by 18 ft. breadth, giving 8 ft. 6 in. of water on the sills. It is in contemplation, however, to increase the size of the locks to 330 ft. by 21 ft. 6 in. A new canal has recently been constructed linking up the Don navigation with the Goole and Knottingley Canal portion of the Aire and Calder system. One great advantage possessed by this system is the long stretch of natural river, but much credit is due to the management for the enlightened policy pursued. The terminal docks at Goole have recently been extended and deepened, and the approaches improved, so that vessels up to 2,000 tons, with a draught of 19 ft., can enter the docks on ordinary spring-tide. To Mr. Bartholomew, for many years engineer to the company, is due a great deal of the credit for the high condition of efficiency at which this navigation has been maintained. To his initiative is due the introduction of the trains of compartment boats for conveying coal in bulk, which is claimed as giving the cheapest carriage known at the present day, the cost of towing these trains by tugs having been stated by Mr. Bartholomew at ¾d. per ton mile, than which nothing cheaper in the way of haulage has yet been devised. These trains, consisting of 25-ton boxes, are loaded at the pit-mouth, towed to the number of about 25 to Goole Docks, and tipped direct into the holds of ships.



THE LONDON FLIGHT OF LOCKS PRIOR TO CONSTRUCTION OF LIFT.

WEAVER NAVIGATION

This little system, artificial for its whole length of 20 miles, is another instance of what can be achieved by inland waterways under good management. It is claimed, indeed, that the experience gained on the Weaver system was freely used in the planning and construction of the Manchester Ship Canal. Up to a comparatively recent date the Weaver was practically dependent on the salt and alkali industries alone; but the construction of the Anderton lift in 1875, forming a junction with the Trent and Mersey Navigation, has led to the development of a large trade with the Midlands, and, indeed, it has been suggested that the Weaver Navigation should form part of a proposed waterway from Liverpool to the Midland counties. The Weaver at the present time can receive barges up to 500 tons burden, and the locks are large enough to pass a train of smaller barges carrying 1,000 tons, such a train of barges being self-contained, and rendering loading into ships a simple operation. The Weaver Navigation is about to be improved by increasing the capacity of the Anderton locks.

SEVERN NAVIGATION.

This is an important waterway, and if the proposed canal from Leigh were completed would be linked to the Midlands and to London by standard gauge canals. Considerable improvements have been made in the Severn Navigation of recent years, and vessels of 10 ft. draught can ascend as far as Gloucester. The canal between Gloucester and Birmingham is, however, so small that it will only admit barges of very small dimensions. If the whole of the waterway were made capable of accommodating vessels of the size which now could go right up to Worcester from the

sea, it would be a means of competition with the railway system from Birmingham to the coast, which should be of enormous advantage to the trade of Birmingham and the Midland districts. An attempt was made not long since to awaken interest in Birmingham in the reform of the waterways connecting the town with Bristol, but without success. The Town Council of Birmingham appointed a committee, which went into the matter most thoroughly, particularly with regard to improving the waterway between Birmingham and the Bristol Channel ports. The objection was raised, however, that while the traffic between Birmingham and London and Liverpool represented 90 per cent. of the trade of the town, the trade with Bristol represented only 3 to 5 per cent. Birmingham wanted a scheme which would improve the connection with Liverpool and London. Sir Alfred Hickman brought forward a proposal for enlarging the existing canals at a cost of between three-quarters of a million and one million pounds, which sum was to be raised by pledging the rates not only of Birmingham, but of the surrounding districts, representing a population of two or three millions, to the extent of 2d. or 3d. in the pound, but the whole of the municipalities refused to accept the proposal, and it fell through. At that time there was a feeling that the improvement of waterways was a national rather than a local question.

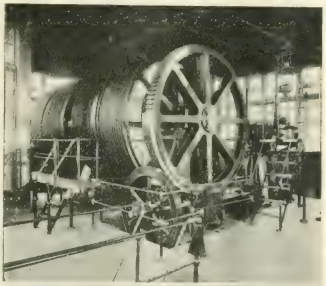
GRAND JUNCTION CANAL.

This is a waterway which has been, and is being, constantly improved under the direction of Mr. Gordon C. Thomas, the engineer. As our section map shows, it joins the Oxford Canal just beyond Braunston, ninety-three miles from Brentford. Unfortunately, the Oxford is only narrow gauge, and no improvements have been made in the canal of late years. In the Grand Junction Canal itself the chief improvements effected during recent years include the duplication and enlarging of the Brentford locks, the development of the water resources at summit levels, and the well-known Foxton lift, which was substituted for the old flight of narrow locks.

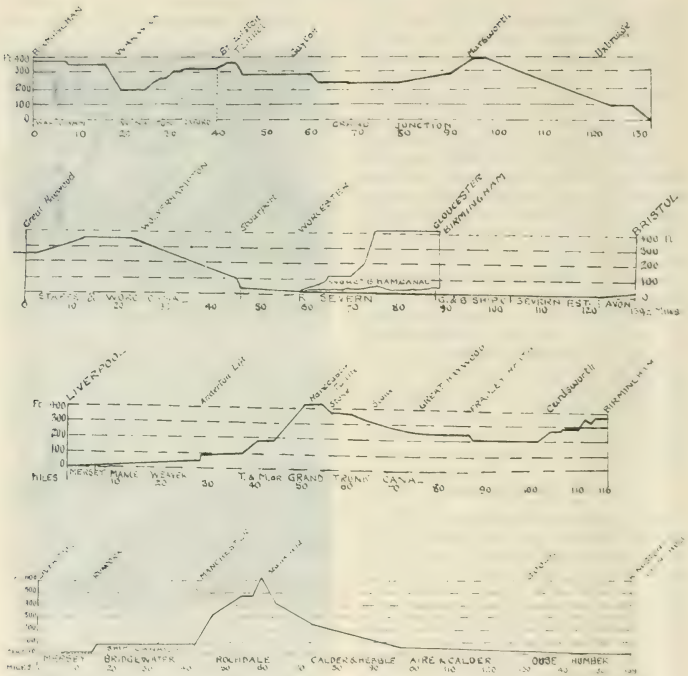
FOXTON LIFT

The invention consists of a system of wet docks wherein vessels to be transferred are water-borne. The docks are mounted on wheeled carriages adapted to support them horizontally and to run on inclined railways extending between the higher and lower water levels, such railways being transverse to the length of the docks, which travel broadside on, so as to admit

The docks are provided with end gates, which open and close for the admission and egress of vessels by



THE OLD FOXTON LIFT AND WINDING ROPE.



SHOWING THE PRINCIPAL EXISTING ENGLISH CANAL MAIN ROUTES.

rising or falling in a vertical plane, suitable grooves being provided for the gates to work in, and means are provided for making a water-tight closure. The end of a dock, when in position at the top of its inclined railway, makes a practical water-tight joint with the standing work of the extremity of what may be termed the head bay or upper pond; the dock then forms a continuation of the upper canal, there being also a similar gate provided at the end of each of the upper bays to retain the water in the upper level of the canal when the docks are absent.

standing work of the upper bay is a direct butt joint between suitable faced surfaces at the bottom and sides of the end of the dock, which close by a direct butting motion of the dock against corresponding surfaces on the standing work. The butting motion of the dock is obtained by hydraulic-pressure rams acting on the reverse end of the dock, thereby causing [illegible] axles of the wheels carrying the dock, sufficient traverse upon the axles for such purpose being provided. The pressure rams also retain the dock in its proper position of contact with the standing work as long as may be necessary for manipulating the vessels.

THE ACME COMBINED CONCENTRATING TABLE.

By L. H. L. Hedgcock.

[illegible] and is the outcome of much experience, thought and experiment on his part. There are three at work and a fourth is about to be installed.

The table consists essentially of two circular beds, inclining towards each other at suitable slopes (generally about 3 in. to 4 in. in 2 ft.), and revolving in the same direction, and by means of the same mechanism. The classified pulp is first treated upon the concave or outer bed, and the concentrates from this are raised by a dipper wheel to be further treated upon the inner or convex bed. In between the two beds is a circular launder, divided longitudinally into two parts, and into the two launders so formed the products from the outer and inner beds respectively fall.

A combined half elevation and section of the table is shown in fig. 1, while fig. 2 shows it in plan. The method of driving the table is clearly shown, together with the manner of supporting the beds from the vertical axis. The table is designed to treat slimes, and working upon the Cornish tin ore makes about one revolution in three minutes; its diameter is 19 ft. and the beds in the example upon which the trial to be described was run have a slope of $\frac{3}{8}$ in. [illegible]

METHOD OF WORKING.

The stream containing the pulp enters an upward current classifier; the overflow passes to the dipper wheel (often called elevator) by which it is raised to the outer feed launder and delivered at A, fig. 2; the sands from the classifier are settled and treated apart. The pulp then flows down in two directions from the point A towards B and C; the channel conveying the ore is highest at the point A and slopes down on each side to B and C. The ore flows upon the table in a gentle stream through the buttons indicated on the plan, which can of course be adjusted [illegible]

[illegible] point C where it meets the onflowing current containing the ore, or rather that part of it (usually small) which has not already passed through the buttons on to the table. [illegible] outer portion [illegible] point [illegible] is passed in [illegible] revolution. The direction in which the table revolves is shown by the arrows.

The fresh water flowing past the buttons between D and C washes away from the settled slime any waste remaining, and the concentrate caught upon the bed is finally washed off by the jets of water from the pipe E into the launder F.

The partly concentrated pulp now goes to the "dipper" by which it is raised to the launder G and delivered into a central chamber, clearly shown in the elevation fig. 1, with the pipes H leading from it, similar in principle to that often seen upon a round buddle, from which it flows by the pipes H to the launder J and thence upon the convex (inner) bed past the buttons and distributing aprons.

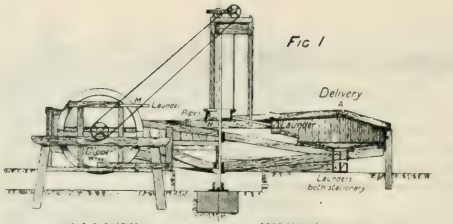
Fresh water is delivered to the launder J (by the pipe K) fig. 2, between the stops Q and R., from which it flows gently upon the convex (inner) bed to wash the waste from the settled slime.

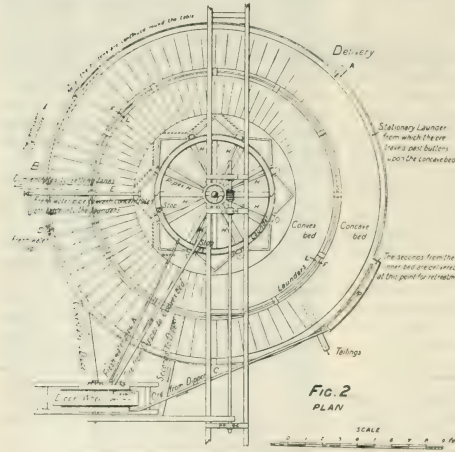
The final concentrates are washed into the launder L by jets of water from the pipe E shown, and run into suitable settling tanks.

These concentrates have to be washed off into the launder with a strong stream of water, and thereby there is mixed with them an additional large volume of water which has to be drained away again. This involves large settling tanks and increases the liability to loss in the overflow. It would appear a great advantage to this type of table if some means of collecting the concentrates could be devised which would avoid this excessive dilution.

The tailings run away to settling pits and may be further treated for the small amount of cassiterite they contain, upon "rag" frames. These automatic frames are economical and efficient in dealing the excessively dilute slime. This dilution of the slime appears to greatly militate at all points against close saving; with such a slimy ore even a large number of spitzkasten, however efficient, cannot thicken the slime without appreciable loss with the overflow.

[illegible] by the launder marked "seconds to dipper" in the [illegible]





THE ACME COMBINED CONCENTRATING TABLE.

Launder M (see figs. 1 and 2) to the distributor P, from which they go upon the outer bed for re-treatment. The concentrates from the inner bed goes to the tailings.

The "dipper" or elevator is of excellent design and makes about three revolutions per minute. It is 5 ft. in diameter, and consists essentially of a circular disc built up of wood from a cast-iron boss, with wooden buckets upon each side of the disc near the circumference. There is a noticeable absence of splash and but little loss at the point where the buckets first commence to discharge as they reach the top. With this form of dipper clear water may be delivered by the set of buckets upon one side, while the other set discharges the pulp.

The power required to drive the table and dipper is about 0·75 h.p.

The teeth of the spur wheels attached to the vertical shaft in this table are merely cast. When they have worn sufficiently to work fairly smoothly, a certain slight jerk in the revolution of ⅛ the table is noticed, due to play between the teeth and the worm gear. If the teeth were accurately machine-cut, this jerk would with advantage be eliminated.

Just in rear of the jets from the pipe E washing off the concentrates, a piece of rubber—a portion of an old Vanner belt is excellent—loaded with a piece of iron is allowed to rest upon the bed. This ensures every particle of settled mineral being washed off and leaves the bed clean for the next revolution with the pores of the wood well cleared and free from the slimy coating so detrimental to good work. Two light brushes are allowed to rest on the inner bed when the partly concentrated ore from the outer (concave) bed first comes upon it.

In a trial made by the author, the following results were obtained:—

Sample from.	Black Tin. per cent.	Sn. per cent.
Material to classifier ..	8·50	6·27
Feed to table after leaving classifier	11·25	8·44
Concentrates	91·00	68·32
Tailings	1·30	1·02

From the above it will be seen that the material fed to the table is enriched from about 8¼ per cent. to 68 per cent. of Sn in one operation.

Abstract of paper read before the Institution of Mining and Metallurgy.

FIG. 1. CAPOUSE WASHERY, NEAR SCRANTON, PA.

A TYPICAL ANTHRACITE WASHERY.

By George W. Harris.

THE different conditions of mining in the anthracite regions have largely affected the character of the resultant culm banks. In the middle and upper portions of the Lackawanna region, from near Wilkes-Barre to Forest City, the seams have little pitch, and most of the loose rock resulting from mining operations was left in the chambers; while in the steeper seams of the middle and southern regions, practically the entire product of the mine was frequently loaded in cars and sent to the surface, the rock and much of the coal screenings being placed in the same dump. Moreover, the dry preparation of coal in the Lackawanna region tended to a greater saving of the smaller sizes, which were stocked in banks. On the other hand, wet preparation in other regions was more wasteful of the [illegible] coal [illegible] used in washing. In other instances, the culm was spread over many acres of ground, destroying vegetation and generally contributing to the barrenness of tracts already denuded of timber. Under these conditions [illegible] circumstances indicate the Lackawanna region as the natural field for washery operations; and it is in the Lackawanna and Wyoming valleys that the greatest development of this branch of the coal industry is found.

During the year 1903, the shipments of coal from washeries amounted to 3,077,999 tons, of which quantity 2,875,981 tons (about 78 per cent.) came from the Lackawanna region, and 309,244 tons from the Pottsville districts. This output from the washeries constituted 5.92 per cent. of the total quantity of coal sent to market in 1903.

In general, the machinery and some of the methods used in washeries do not differ materially from those seen in portions of breakers preparing the smaller sizes of freshly-mined coal; in fact, the washery is [illegible] which the coal is prepared dry. The important difference is that the washery is essentially wet, the success of this practice being largely due to the abundant use of water, which not only removes clay and coal dirt, but greatly assists in the separation of the various sizes on the screens [illegible]

to meet special requirements.

Starting at the culm bank, the first step in the operation is the transportation of the material to the washery. The culm is fed to conveyors by hand or by steam shovel, then loaded into cars, which are hoisted to the top of the washery; or, as is becoming common practice, it is flushed into conveyors by means of a hose, as in hydraulic mining—a stream of 2.5 in. diameter being sufficient to carry the culm to the conveyors in sheet-steel chutes placed at a slight angle to the horizontal.

As the bank recedes, the chutes are taken up, the underlying culm is shovelled into the conveyor, and the scraper line is moved closer to the bank. Generally, there are several lines of conveyors, the one nearest the washery being permanent, and the others (feeding into it) movable. A difficulty often encountered in working these banks is the occurrence of ashes, from the boilers of former times, which have been mixed with the coal on the bank. The separation of these ashes from the valuable portion of the [illegible]

THE CAPOUSE WASHERY.

This [illegible] practice of flushing [illegible] conveyors is followed at the Capouse washery of the Scranton Coal Company in the Keyser Valley, north of Scranton, on the New York, Ontario and Western Railroad. This company also operates the Mount Pleasant washery at Scranton, and the Raymond washery at Archibald.

At this plant there is a fixed scraper-line, 380 ft. long and a 500-ft. movable conveyor, each driven by an independent 10-in. by 16-in. Nagle engine. These endless-chain conveyors run in a framework, the bottom line moving in a sheet-steel or cast-iron trough and returning on T-rails overhead.

The conveyor delivers the fine material at the foot of the main elevator of the washery, where it is washed, sized, the slate removed and the large pieces of coal re-broken. A typical plant for handling culm containing few pieces of large size is illustrated in [illegible]

The washery, having a capacity of 120 tons of prepared coal per hour, occupies an area of about 53 ft. [illegible] approximately

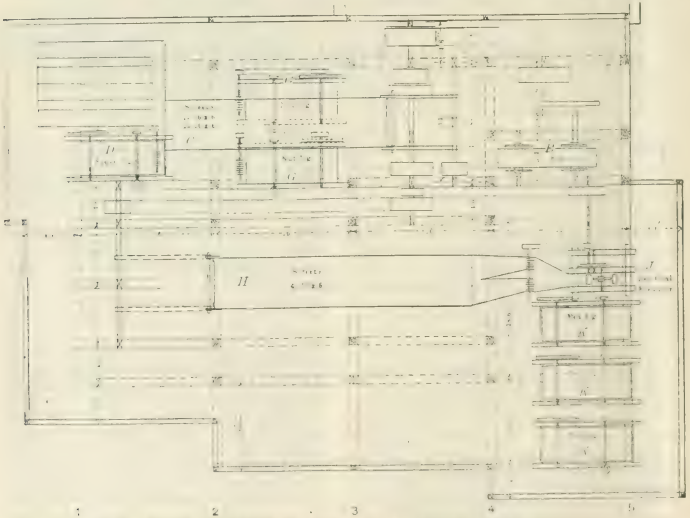


FIG. 1. CAPOUSE WASHERY—PLAN SHOWING THE POSITION OF THE MACHINERY.

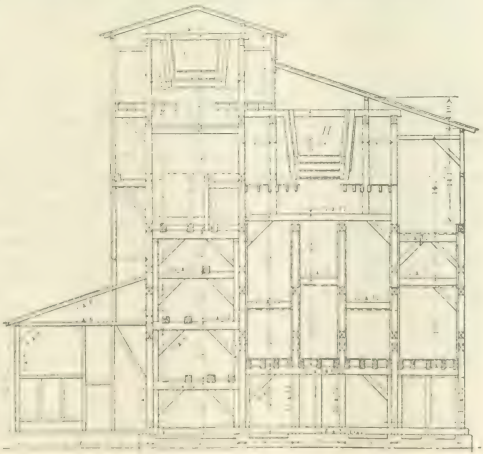
80 ft. high. Figs. 2, 3, and 4 show the details. The frame of the building is of mortised construction, with 12-in. by 12-in. posts braced by 8-in. by 8-in. timber. The stringers supporting the machinery and those under the coal pockets are of 12-in. by 14-in. oak. The compactness of this plant is quite striking when compared with coal breakers having a similar capacity. In marked contrast also is the absence of the clouds of coal dust which arise during working hours at the breakers in the Lackawanna region.

The preparation of the coal at the Capouse washery begins at a point where the scraper line discharges into a chute leading to the main elevator. A man stationed here throws out large lumps, breaks those containing coal into smaller pieces, which are then thrown into the elevator boot, *A* (fig. 4), removes any pieces of foreign material—wood, iron, slate, etc., and controls the feed of the coal to the elevator. In the washery, the main elevator is 65 ft. long from centre to centre of sprocket wheels, and carries seventy-one water-tight buckets, each 12 in. by 28 in. in size. The elevator material is discharged into a chute, *B*, which feeds the first shaking screen, *C*. (In washeries the revolving, circular screen has been almost entirely superseded by those of the flat, shaking type because the fine mesh of the former becomes clogged with dirt, despite all efforts to prevent it.)

The shaker or "mud" screen, *C*, consists of three screens, the top one being 7 ft. by 6 ft., and the two others 5 ft. by 6 ft. in area. The screens are driven by eccentrics, set so that each one receives a throw at a different time from the others, an arrangement which is necessary in order to avoid undue vibration of the framing. As soon as the material strikes the top screen, it is sprayed with water from a perforated pipe, and passing down the screen, goes under a box from which a copious stream of water escapes. The mesh 21 in. of the top screen have 1·5 in. round holes through which pass the chestnut and smaller sizes pieces to the screen below. Next to the 1·5 in. round holes are placed angle iron, having the angle uppermost, thus Λ, the edges spaced 0·75 in. apart, which allows flat pieces of slate to fall through. The last 4 ft. of the top screen have 2-in. round holes which permit pieces the size of stove coal to fall through to a chute; pieces larger than 2 in. pass over the end of the screen to another chute. The stove coal goes to jigs, *D*, thence to rolls, *E* and *F*, and, after being broken to pea size and smaller, to the main elevator boot, *A*.

The large coal is hand-picked by six men and boys and the slate removed, after which it is sent to the rolls and the main elevators. The coal that drops through the top screen of the shaker, *C*, falls on to the second screen having $\frac{7}{8}$-in. holes, the chestnut size passing over, and pea and smaller sizes dropping through to the lowest screen. The chestnut size goes to jigs, *G*, thence to rolls, *E* and *F*. The bottom screen has $\frac{3}{8}$-in. holes, which permit the fine coal dirt, slush or culm (it is called by all three names) and mud to pass through to a trough, which delivers to a settling pond near the washery, where the stream spreads over a large, nearly level, area, and deposits the suspended materials. The pea size and smaller sizes of coal pass over the bottom screen to a second shaker, *L*.

The shaking screen is simple in construction, effective in action, occupies little space, and needs few repairs. At the Capouse washery, each screen is



CAPOUSE WASHERY—TRANSVERSE SECTION.

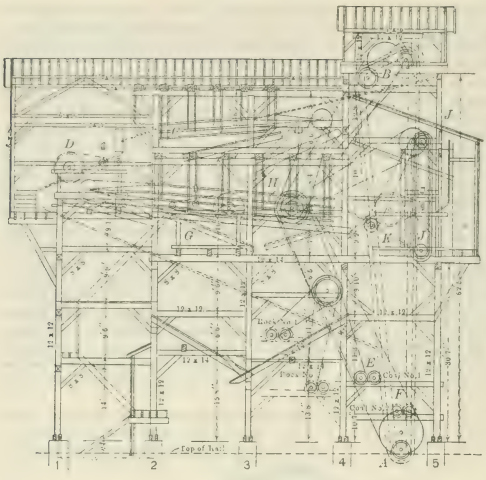


FIG. 4. CAPOUSE WASHERY (PARTLY IN ELEVATION): LONGITUDINAL SECTION.

suspended by ⅞-in. by 8-in. ash boards, their upper ends bolted to overhead beams and the lower to castings which journal on bars passing under and supporting the screens. Two boards, comprising the hanger on each side, are set at an angle from the vertical so that they act as braces and prevent the screens from swaying sideways. When suspended by rods, the screen travels between guides to insure greater steadiness. Both methods of suspension are used, the boards having the preference.

The shaker [illegible] consist of four [illegible] screens, the top one having an area of 30 ft. by 6 ft., the next lower 26 ft. by 6 ft., and the two lower being 20 ft. long by 6 ft. wide. The coal passing through this shaker is separated into sizes as follows: the top screen, with 0·5-in. mesh, allows the pea coal to pass over, and No. 1 buckwheat and all smaller to drop through: the next screen, with 0·375-in. mesh, separates No. 1 buckwheat from the smaller sizes, the latter dropping through to the next lower screen with a ¼-in. mesh; this last screen makes No. 2 buckwheat or rice-coal: No. 3 buckwheat or barley passes over the lowest screen which [illegible] coal to be carried by the wash water to settling pond No. 2. The wisdom of keeping the mud from the shaker, *C*, separate from the fine coal of the shaker, *H*, when possible, will be more apparent as time goes on, and this fuel becomes valuable as material for briquette- or for burning as dust.

The three buckwheat sizes from the shaker, *H*, go direct to pockets, but the pea coal must be cleaned of slate. After the pea size leaves the top screen it passes down a chute, in which is a triangular device raised about 6 ins. above the bottom [illegible] to allow flat pieces of slate to pass under while the coal goes to the elevator, *J*, and [illegible] to the jigs, *K*. After leaving the jigs, the coal passes through a Pardee spiral picker for further cleaning and thence to a pocket.

A number of features about this washery are deserving of special mention. The six jigs (measuring [illegible] by 5 ft. 4 ins. by 6 ft. 1 in.) are driven by a 7-in. by 8-in. engine. The coal receives a reciprocating motion in a pan immersed in water, which action causes the slate to sink, while the lighter coal passes out at the top. Generally three jigs are sufficient to clean the coal, the others being held in reserve. The larger-mesh screens on the shakers are of steel; but those of $\frac{3}{32}$-in. mesh, on account of the small perforation, must necessarily have thin metal to prevent clogging, and therefore are made of bronze, in order better to withstand the action of the acid mine water used in washing the coal. At the Capouse washery, the shaker, *H*, has, above the tier of screens, four overflow water boxes, which are very efficient.

The shaker, *C*, receives from 165 to 170 thrusts per minute, and the shaker, *H*, about 180. To re-break large coal to pea size and smaller, two rolls are used, the roll, *E*, being 24 in. by 24 in., and *F*, 21 in. by 20 in. The [illegible] shown in fig. 4 were used to crush slate, taken from the coal, to a size not larger than pea, which was then sent with the fine coal to [illegible] but [illegible] at the Capouse washery.

As previously stated, a large quantity of wate[illegible]

[illegible] shaft. A bull pump raises water from the mines and delivers it to a reservoir near the washery, the pumping equipment of which consists of three No. 10 Knowles pumps, 16 in. by 10 in. by 16 in. It is estimated that each pump furnishes 500 gal. per minute; two pumps raise water to the top of the washery, through their two 6-in. columns which connect at the top; the third pump supplies water for flushing the material into conveyors at the culm bank. All water pipes about the plant are at such an angle that when work stops, valves are opened and the water drains out, thus preventing the pipes from freezing up in cold weather.

POWER PLANT, LABOUR, ETC.

The machinery [illegible] Dickson engine, running at 78 revolutions per minute. The steam is supplied by three fire-tube boilers, housed in a substantial brick building, situated at a distance of 500 ft. or more from the washery.

The labour required to run the plant consists of from forty to fifty men and boys, a larger number being needed in winter than in summer to clean out railroad cars, etc. The outside force includes a foreman in charge of the whole plant, two hose-men, ten or twelve men on conveyor lines, two men to run the conveyor engines, one man at the elevator boot, and two men at the settling ponds. The force inside the washery is distributed as follows: One machinist or oiler, one carpenter or repair man, three jig runners, eight slate pickers, one engineer, one man at the head of the main elevator, four loaders, two car-repair men, six slate dump men. In addition, there are at the boiler-house three firemen, one man to cart out ashes, and one man to wheel in coal. The Capouse plant has shipped coal since November 1st, 1900, and during 1904 worked 182½ days of nine hours each, producing 184,004·7 tons. The record for the washery was made January, 1902, when 31,018 tons were produced in 262½ hours.

Washery-coal appeals to the operator and the engineer, as well as to the consumer of fine coal, particularly in cities. The operator sees in these large accumulations from former mining operations a great quantity of coal readily available for quick shipment when occasion demands. During the anthracite strike of 1902, these washeries, being comparatively easy to operate, and requiring a relatively small number of men (mainly unskilled), were for months the only productive source of hard coal. Large shipments from these plants were made for some time after the mines resumed; and for this cheap supply of smokeless fuel there was a great demand from steam-users in many neighbouring cities. From an engineering standpoint, the reclaiming of coal from culm-banks is gratifying, because it recovers value from the great waste which attended the early mining of anthracite.

[illegible] in Vol. [illegible] of Mining Engineers.

NEWS ITEMS.

Institution of Civil Engineers.

It is announced that 48 Associate Members have been transferred to the class of Members, viz., Messrs. [illegible] R. J. Angel, Eduardo Argenti, Herbert Ashley, C. J. Batley, Harry Becher, C. E. Bremner, C. J. Brown, James Brown, F. A. Campion, J. P. Copland, W. R. Copland, junr., H. G. Coventry, F. J. Dawson, W. B. Dawson, A. L. Dickie, J. R. Dixon, R. J. Durley, G. E. Fedden, F. C. Fowle, J. W. F. Gardner, David Gravell, T. A. Hall, H. J. S. Heather, C. O. Henriques, D. W. Herbert, Arthur Hill, Frank Howarth, [illegible] J. A. McPherson, D. E. Marsh, Frank Massie, H. J. [illegible] F. G. Royal-Dawson, W. B. Shaw, A. M. Tippett, [illegible]

The Port of London.

Lecturing on Monday at the London Institution, Mr. J. G. Broodbank, secretary of the London and India Docks, said it was an error to say that Liverpool was ahead of London in railway facilities. London docks had railways along them, and they were the deepest docks in the world. He declared that the proposed barrage would be a disaster. Despite all that had been said to disparage the Port of London, it remained the greatest port in the world.

Mr. A. J. G. Swinney, M.Inst.M.M., left London on [illegible]

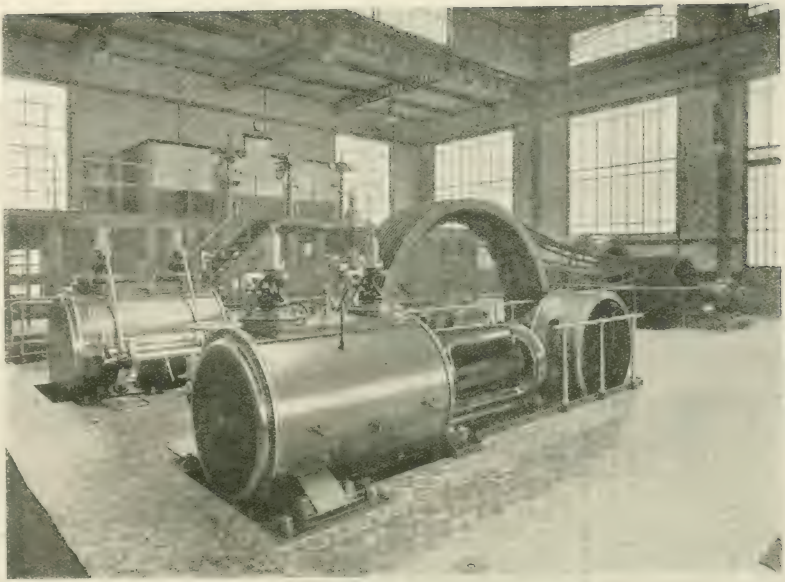


FIG. 8.—THE INSTALLATION OF THE SOCIETE D'ELECTRICITE AT ROUEN.

The installation at this station consists of a tandem engine of 1,200 h.p., constructed by Carels Freres, and having the following principal dimensions: Diameter of h.p. cylinder, 25 in.; diameter of l.p. cylinder, 43½ in.; piston stroke, 45 in.; speed, 94 rev.-lutions. The engine works condensing with superheated steam at 75 lbs. per sq. in. pressure. It is connected with an alternator running triphased at 50 periods per second.

THE GALLERY OVER MACHINE SHOP DEVOTED TO INSTRUCTION OF APPRENTICES.

THE ENGINE WORKS OF MESSRS. CARELS FRÈRES.

BY P. R. ALLEN, A.M.Inst.C.E., M.I.Mech.E.

(*Continued from page 77.*)

THE system of erecting, gauging, and inspecting engines referred to in the previous article is certainly more conducive to a successful start up than when the pieces are sent out from the maker's works without ever having been near one another, a practice which is, unfortunately, not unknown.

The system of gauging and inspection is very elaborate at these works. There are three inspectors who preside over a room where the micrometer gauges and testing machines and all the other delicate measuring instruments are kept private. Besides seeing that all the working gauges are kept strictly to standard, these inspectors check and gauge every part as it passes from the fitting shop to the erector, and their daily work in this direction is entered in a book, which every morning is sent for the personal inspection of Mr. George Carels, one of the members of the firm.

This arrangement ensures a practical interchangeability of parts in all similar engines, but the system of checking and recording is carried beyond this. Of course, 1,000 h.p. engines are not built in batches, and put through the shops a dozen or so at a time, and while engines of the same power and of the same [illegible] the same [illegible] very

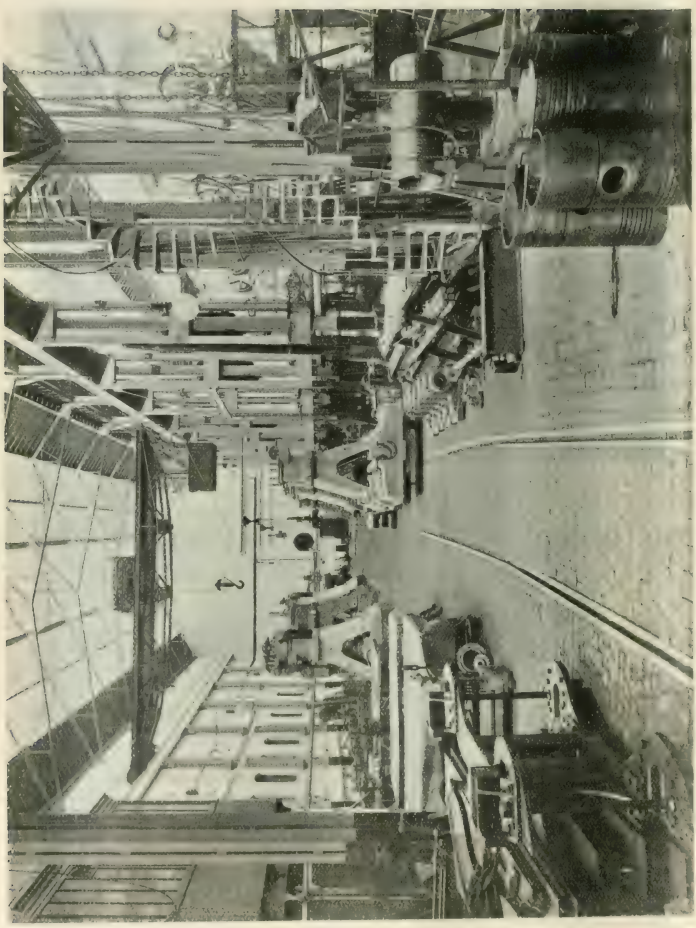


FIG. 10. VIEW SHOWING INTERIOR OF "DIESEL" ENGINE SHOP.

reasons to have to slightly vary some of the dimensions; for instance it may be desirable to bore the cylinder out a millimetre larger in one case than in another. However, whatever variation there may be in this way, it is not allowed to go unnoticed, as whenever a new engine is put in hand, a kind of diary of workshop measurement is started, and the actual measured dimensions of the engines as delivered to the purchasers are kept in the inspector's office. This is a set of records quite independent of the drawing office, as, while the engine is built to working drawings, the inspector's drawings are made to actual measurement of the finished engine.

The locomotive department is carried on to some extent as a separate branch, and although the same degree of accuracy is exacted as in the case of the stationary engines there is little that need be referred to here.

Messrs. Carels claim that there are steam engines built by them representing over 300,000 h.p., and out of this total over 80,000 have been constructed to work with superheated steam, the first engine of this kind having been built in 1807

GRAND HORNU INSTALLATION

Prior to visiting the works at Ghent, the writer had an opportunity of seeing the very fine pair of engines made by Messrs. Carels Frères, and installed at the power station of Grand Hornu Mines, near Mons. There are two of these engines coupled direct to three-phase generators. One of the engines is a tandem compound, and the larger one is similar in design, but a twin tandem compound, with the revolving field magnets placed between the two sides of the engine. The single tandem engine will give a normal output of 1,350 i.h.p., and the twin set, therefore, develops 2,700 i.h.p., but has an overload capacity up to 4,000. The steam consumption of the twin engine was guaranteed to be:

Indicated h.p., 1,250, 1,650, 2,700, 4,000.

Steam consumption lb. per i.h.p., 12·12 lb., 11·57 lb., 11·37 lb., 12·21 lb.

Diameter of high-pressure cylinder, 31·5 in.

Diameter of low-pressure cylinder, 51·5 in.

Stroke, 53 in.

Revolutions per minute, 88.

A high degree of superheat it should be stated can be obtained at the boiler, and when working condensing, the admission pressure of the steam is 128 lb. and the cutoff is 15 per cent. of the stroke in the high-pressure cylinder. A speed variation of 8 per cent. is obtainable by the adjustment of a sliding weight on the governing arm. On the large engine the total weight of the revolving fields with the pole horns amounts to about 120 tons, and the flywheel effect at 88 revolutions per minute equals 24,780,000 ft. lb. In the single tandem engine, the total weight of the flywheel of the revolving magnet portion is approximately 80 tons, and the flywheel effect 9,000,000 ft. lb. The writer can speak personally as to the excellent results obtained by these engines working against a very variable load.

THE "DIESEL" OIL ENGINE.

Messrs. Carels Frères recognised some years ago that the internal combustion engine as a competitor of the steam engine would have to be reckoned with, and built a new extension to their works for the construction of "Diesel" oil engines. This annexe is fitted up with tools specially adapted for the work, and one of these large combination machines is shown in fig. 10 milling a cylinder of a "Diesel" motor. At first considerable difficulty was experienced in building the "Diesel" engine to work with ordinary commercial Texas oil. However, this has now been quite overcome. These engines are built by Carels Frères for the English market, and the writer saw quite a number in progress to the order of the English Diesel Engine Company.

The cycle of operations in the "Diesel" engine is well known, it being substantially an "Otto" cycle engine, with the charge of oil injected just at the end of the compression stroke. In the engines now being built at Ghent

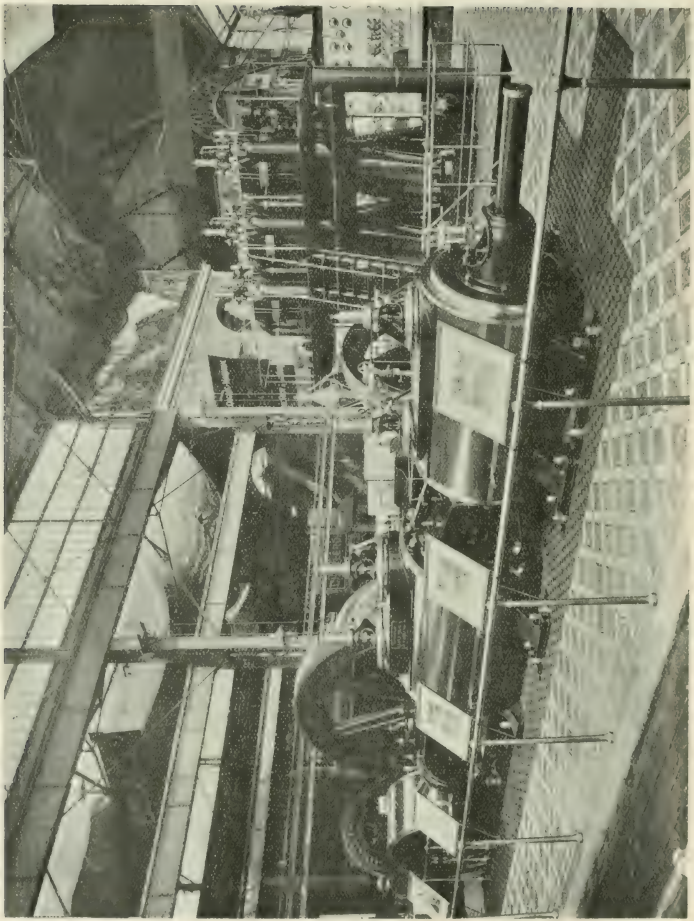


FIG. 14.—STANDARD ENGINE EXHIBITED AT 14TH WITH 500 H.P. THREE-CYLINDER "DIESEL" ENGINE IN THE BACKGROUND.

the injection arrangements have been lately modified, and the oil charge is introduced in a finely divided or pulverised form by means of a charge of highly-compressed air, supplied by a Reavell air compressor. This makes a very compact arrangement, and it is rather interesting to find that a design originating in England should have been found the most suitable for the purpose.

Messrs. Carels Frères build these engines at 75 h.p., and multiples of the same, that is to say, 150 h.p. would be two of these engines placed side by side on the same bedplate. However, besides building these standard sizes, they have lately elaborated a larger design, in which three cylinders combined give 500 h.p., and a fine machine of this kind was shown at the Liége Exhibition, and is represented in the rear of fig. 11, which also shows in the foreground one of the standard engines already referred to.

THE "VOGT" GAS ENGINE.

Messrs. Carels Frères are one of a group of makers who have undertaken the construction of the "Vogt" gas engine, in which the force of the explosion is transmitted to the working piston by a body of water. The writer was privileged to see the first engine of this kind that had been constructed at Ghent.

FACILITIES FOR TECHNICAL EDUCATION.

While so much is being talked about technical education, it is interesting to find that in these works a system of technical education of a very practical kind has been instituted by the proprietors, one of the galleries over the machine shop being set apart exclusively for the instruction of the younger apprentices, and it will be seen from fig. 9 that this is quite a capacious room, with a considerable number of lathes available for the progressive instruction of the learners as they become more efficient.

THE MOTOR YACHT CLUB.

The Motor Yacht Club, which, since its inception in June last, has already accomplished much useful work. The first events of importance were the reliability trials carried out in Southampton Water on [illegible]. Out of the entry of eighty-seven thirty-one boats entered the dock for competition, the trial being a test of reliability during twenty hours' continuous running under observation. The judges, however, owing to the rough weather on the second day, decided to curtail the duration of the run by five hours. That these trials were a distinct success was shown by the fact that the entries were more than double those received for the trials carried out [illegible].

In their report the judges stated that, taken as a whole, the [illegible] showed a marked advance, many of the features of the boats which competed in last year's trials having been improved upon. The judges, however, noted with regret that an important exception to the above was found in the methods of fuel storage and supply in the petrol boats, which, except in one or two notable instances, left much to be desired. The chief defect noted in this regard was the [illegible] tank and [illegible] sisted of a small pipe indifferently fitted to the tank and led unprotected, and, in some cases, right through the middle of the fore peak, exposed and liable to damage. It appeared to the judges that by the adoption of a pressure-fed system of fuel supply many difficulties in the way of a really satisfactory installation are removed, especially in the smaller open boats.

Scope for improvement was indicated in connection with the quiet running of the engine, and the electrical connections and fittings in some of the smaller boats.

The promises of support from various quarters and the satisfactory financial position induced the Committee to consider the advisability of securing a floating club house, and with this object in view they have been fortunate in securing the ex-Admiralty yacht *Enchantress* for a term of years. This vessel, which is over 1,000 tons register, is eminently suited for the purpose, having sleeping accommodation for upwards of thirty members, beside saloon accommodation; her engines having been removed, there is ample room for making a large saloon, 80 ft. by 26 ft. by 20 ft., for the purpose of a dining or ball-room. With these social facilities, it is anticipated that there will be a [illegible] ensuing season.

THE SMITH-DAVIS PREMIUM CALCULATOR.

We illustrate below a very ingenious instrument which has been perfected by Messrs. John Davis and Son (Derby), Ltd., for the instant solution of those nice calculations which are too frequently a thorn in the side of the piece-work calculator. The machine is designed in fact to dispense with calculation altogether when arriving at the proportion of the total balance-money that is due individually to any number of men sharing profits on the same contract, the divisions being proportional to each man's fixed daily or weekly money rate. When work is paid for on the premium system the instrument may also be used for finding the time allowance that is to be added to the actual time occupied on the contract. The instrument is provided with scales, approximately 11 ft. long, having a range from 1d. to £20, and marked so that they can be used either for money or time calculations. Small sections of these scales, approximately half size, are illustrated herewith. Divisions of the scale are from pennies from the lowest amount up to £1. From £1 to £3 the divisions are in 2d. Balances within these ranges can be read with ease to one halfpenny. From £3 to £10 each division represents 6d. From £10 to £20 each division represents shillings and in the latter range 6d. can be easily read.

The scales are engraved on strips of celluloid which are affixed to the rims of two similar wheels so arranged that the divided edges come together. The wheels are mounted on a spindle which is carried at each end in bearings formed in a supporting stand made of wood. One wheel is fixed to the spindle while the other is free to revolve upon it. The free wheel is pressed against the fixed wheel by a spring which is sufficiently strong to cause it to turn with the fixed wheel when the latter is rotated. The method of handling the instrument will be understood from the illustration below (fig. 1).

To facilitate the setting of the scales with respect to one another, a treadle gear is arranged to take the pressure of the spring so that when the fixed wheel is held by the left hand the free wheel can easily be rotated by the right hand in either direction. When the desired relative position of the two scales has been obtained the treadle is released and the two wheels are automatically locked firmly together.

METHOD OF HANDLING THE SMITH-DAVIS PREMIUM CALCULATOR.

For piece-work it is convenient to use the left-hand scale as the wages scale and the right-hand scale as the balance scale. The purpose and method of using the instrument can be readily shown by means of an illustration and example.

Five men, L, M, N, O, and P, whose combined weekly wages amount to £[illegible] are engaged on a contract worth £[illegible]. The difference of these two amounts, viz., £4 17s. 6d. is the balance which has to be divided amongst the men in amounts proportionate to their fixed wages. To find the proportion of the balance due to each man,

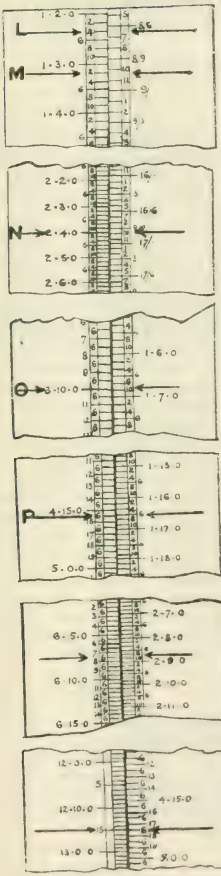


FIG. 2. ROUGH DRAWING ILLUSTRATING METHOD OF APPLICATION.

FIG. 3. [illegible] PHOTOGRAPHIC ENLARGEMENT OF THE ACTUAL [illegible]

£4 7s. 6d. on the balance scale is placed opposite to £12 12s. 0d. on the wages scale. Then on the balance scale opposite the amount of each man's weekly wage on the wages scale will be found the proportion of the balance to which he is entitled, as follows (see fig. 2).

Man	Readings on Wages Scale.	Readings on Balance Scale.
L ..	£1 2 4	[illegible]
M ..	[illegible]	[illegible]
N ..	[illegible]	[illegible]
O ..	[illegible]	[illegible]
P ..	[illegible]	[illegible]
	£12 12 0	£4 7 6

Total of weekly rates £12 12s. 0d. Total balance to be divided £4 7s. 6d.

For sums greater than £20 place half, quarter or reduce the total balance by any divisor to bring it down to a figure within £20. Treat the balance payable similarly. Place the balance (so treated) against the wages paid (so treated) and read as before.

For premium work it is only necessary to use a short range of the scales, and where the premium system is extensively used, although the instrument under review will serve every purpose, it is handier to use a smaller instrument with special scales. On the instrument which has been described, it is convenient to read hours in place of shillings and 5 minutes as 1d. For premium work as for piece-work calculations, the method of using the instrument is best shown by example. Thus—

	Hrs.	Mins.
Time allowed for a job	[illegible]	
Time taken	[illegible]	
Time saved	[illegible]	

It is required to find the premium time for which payment has to be made in addition to 7 hours, 30 minutes; i.e., if 2 hours, 30 minutes are saved in ten hours, what is the saving in 7 hours 30 minutes? Place 10 hours (10s.) on the wages scale opposite to 2 hours 30 minutes (2s. 6d.) on the balance scale. Then opposite 7 hours 30 minutes (7s. 6d.) on the wages scale read the premium time 1 hour 50 minutes (1s. 10d.) on the balance scale. Result—the man works 7 hours 30 minutes, and is paid for 7 hours 30 minutes plus 1 hour 50 minutes equals 9 hours 20 minutes.

FULHAM REFUSE DESTRUCTOR.

A FURTHER TEST.

The Horsfall destructor at Fulham, which was erected and first tested in 1901, has recently undergone a further test, running from October 9th, 11.30 a.m. to October 22nd, 8.30 a.m. The test was carried out to show a re-arrangement of the boiler settings, which has been carried out by Mr. Fuller, Borough Electrical Engineer. The figures obtained were as follows:—Refuse destroyed, 1,348 tons, 12 cwt., 2 qr.; fires cleaned, 1,478; refuse burnt per fire, ·912 tons; refuse burnt per cell per day, 10·944 tons; water evaporated, 3,626,549 lb.; water evaporated per pound of refuse, 1·2 lb.; error in meter, 6 slow; actual water evaporated per pound of refuse, 1·272 lb.; temperature of gases in combustion chamber, average 1,900 deg. Fahr.; temperature of gases leaving boilers 670 deg. Fahr.; temperature of gases leaving economiser 450 deg. Fahr.; temperature of feed water, 100 deg. Fahr.; 520 more fires could have been cleaned, so that at the above rate of burning, another 474 tons of refuse could have been destroyed equalling, over the above period, 1,822 tons. This test was taken under actual working conditions, i.e., from lighting the fires until the fires were burnt out.

The test is interesting by comparison with the official test in December, 1901. On that test the Destructor consumed 10½ tons per cell per 24 hours, or practically seven tons per man per shift, and evaporated from and at 212 deg. Fahr. 1·3 lb. of water per pound of refuse. The mean temperature in the combustion chamber was 1,800 deg. Fahr., and the temperature behind the boilers was 350 deg. Fahr. On the later trial after nearly four years' work, the consumption of refuse per cell per 24 hours was 10·9 tons, or about five per cent. more; the evaporation per lb. of refuse from and at 212 deg. Fahr. was 1·53 lb., or 17½ per cent. better than on the original test; the mean temperature of gases in the combustion chamber was 1,900 deg. Fahr., and the temperature of gases leaving the boilers 670 deg. Fahr.

In view of the doubts which are sometimes expressed as to the results obtained from destructors it is pleasing to note that the Fulham Destructor has not only kept up its original performance, but that the later and longer trial, which, moreover was carried out without any interference from the contractors, gave better results all round than the original trial, and results which, owing to Mr. Fuller's careful and able management were much better than the contractor's guarantee.

JHELUM RIVER HYDRO-ELECTRIC POWER INSTALLATION.

THE next power scheme to be undertaken in India is the Jhelum power installation on the Jhelum River in Kashmir. This power plant is to be installed near Rampur about fifty miles below Srinager, where a six-mile conduit will give a head of water at the plant of about 400 ft. The plans call for an installation of about 20,000 h.p.

It is planned to use the power for operating the Kashmir section of the Jhelum Valley Railway electrically along its entire length of 180 miles. A single-phase system of traction will be installed. Possibly the most important immediate use to which the power will be put will be in operating dredgers for the purpose of deepening the Jhelum River in the Kashmir Valley, and thus minimising the floods, which, under existing circumstances, periodically devastate the entire country. The contemplated plant will also allow of the reclamation of a very large tract of land, and permit of the storage of water in Wular Lake above the power plant for sale to the Punjab Irrigation Department. Another important use of the power will be for operating the large silk factory at Srinager, and also for supplying with current the electrical water heaters in the silk mill. In addition, the power will be utilised for other industrial purposes, and for lighting in Srinager and in Abbottabad, Murree and Rawalpindi, prosperous towns in the British Province of Hazara, lying to the west of Kashmir.

Having completed the preliminary arrangements for the Jhelum Power Installation, Major de Lotbiniere, deputy chief engineer of the Government of Mysore, has recommended to his Government that the contracts for the entire hydraulic and electrical equipment be placed with firms in the United States. The contract for the hydraulic equipment has been

PROPOSED POWER STATION ON THE JHELUM CANAL.

awarded to the Abner Doble Company, of San Francisco, and calls for an hydraulic plant complete from the forebay to the tailrace, including the intake, valves, pressure pipes, pressure-pipe thrust blocks, interior piping, water wheels, and nozzles, hydraulic governors, and all details necessary for the equipment. The apparatus and materials are to be delivered at the port of Karachi.

GRAVITY CONDUIT LINE

The gravity conduit line for the power plant will be approximately 34,000 ft. in length, and for the upper 8,500 ft. will consist of an excavated ditch lined with masonry. The remaining portion of the water channel will consist of a rectangular flume, or a wooden stave pipe, such as has been installed so successfully in connection with plants of this character on the Pacific coast. The flume will have a capacity of over 500 cubic feet per second.

The forebay at the end of the gravity line and at the head of the pressure pipes will be constructed of masonry and will be provided with special headgates. The sliding elements of the intake gates will be of timber, all iron and metal parts necessary for the construction of the gates being furnished by the hydraulic contractor.

The pressure lines will consist of riveted steel pipes designed with a factor of safety of five, each supplying one of the hydro-electric units. For each pipe line a standpipe and two special vacuum valves will be provided in order to protect the pipe against injury in case the water should be drawn out suddenly.

At the lower end of each pressure line the last length of pipe will terminate in a flange which will be bolted to a massive cast-iron thrust block that will rest on a heavy cast-iron sole plate or base. The latter will be mounted on a substantial masonry foundation, and held in position by anchor bolts. This fitting will be designed to take the entire hydraulic thrust of the pipe, an ample factor of safety being allowed so that under the most severe conditions there will be no strain on the branch piping in the interior of the power house. Each pressure line will consist of a riveted steel pipe varying in diameter from 30 to 36 in. and a 54 to 36 in. taper pipe, 10 ft. long, at the upper end. The pipes will be 790 ft. in length, and will deliver the water under an effective head of 400 ft.

The interior piping of the power house will consist of welded pipe with welded flanges, all piping and fittings beyond the thrust block being designed with a factor of safety of ten and subjected to a test pressure of one and a half times the working pressure for a period of five hours.

POWER AND EQUIPMENT.

Twelve main units and three exciter units have been planned for the equipment of the power house. Each main unit will consist of a Doble tangential water-wheel with automatic oil-pressure governor, delivering 1,765 b.h.p. to the shaft, under an effective head of 400 ft. Each wheel will be direct connected to a 1,000 kilowatt alternator, the speed of the unit being 500 revolutions per minute. The exciter unit will each consist of a Doble tangential water-wheel, delivering 285 b.h.p. to the shaft under an effective head of 400 ft. The speed of the exciters will also be 500 revolutions per minute.

The hydro-electric units will be of the company's standard two-bearing type, the wheel runner being fastened on the end of the shaft. For each of the main units the Doble Company will furnish a high-carbon, open-hearth steel forged shaft, and two bearings of a special ring-oiling type, provided with revolvable bearing shells. The exciter water-wheel runners will be mounted on the extended ends of the exciter generator shafts.

The water-wheels will be equipped with ellipsoidal buckets, needle-regulating nozzles and centrifugal water guards. The regulation of the main units will be effected by means of hydraulic governors operating jet deflectors. For the exciter units hand regulation will be provided by means of the needle nozzles. The gate

valves for each wheel will be of special construction with outside screw and yoke, bronze-mounted, with by-pass.

The power house will be of solid masonry construction, and will have a wide veranda as a protection from the tropical sun. A double steel roof will be provided and two travelling cranes will be installed for handling the machinery. The transformers will be installed in a bay of the main building or in a separate structure.

The conditions under which the plant will be installed are decidedly out of the ordinary. The specifications for the electrical and hydraulic equipment stipulated that no single piece of machinery should weigh more than four tons when packed, for the reason that there is 200 miles of road transportation, including a lift over a range of mountains 8,000 ft. high. Transportation in that section of the country is limited to bullock cart, and no single piece of machinery heavier than 4 tons can be transported, a total of 5 tons including the vehicle being the maximum weight that can be hauled over the mountains.

The cost of Portland cement delivered at the site is prohibitive for heavy concrete work, but as there is plenty of natural rock in the vicinity, masonry construction will be used for the walls of the power house and for the foundations of machines, intake, forebay, etc.

The entire hydro-electric installation will be constructed, erected, tested, and placed in operation under the supervision of Major A. J. de Lotbiniere, R.E., Major D. Fraser, R.E., and Captain Thomson, R.E., will act as his engineering representatives in London. Mr. A. C. Jewett, formerly of the General Electric Company, will serve as installing engineer for the Government.

SHIPBUILDING NOTES.

On Saturday the 6th inst. Messrs. Harland and Wolff launched the express steel twin screw steamer *Heroic* for the Belfast Steam Ship Company, Ltd. The vessel, which is the first of two sister ships under construction by Messrs. Harland and Wolff for this company, is larger than any vessel at present in their fleet. Besides embodying the latest general improvements in marine architecture, several specially noteworthy features will be introduced in the new vessel, such as single berth cabins and quadruple expansion engines on the "Balanced" principle similar to those fitted by the builders in the great Atlantic liners. The *Heroic* is 320 ft. long by 41 ft. beam and over 2,000 tons gross; she has large cargo [illegible]

[illegible] on the 10th inst., a steel-screw steamer which has been built to the order of Messrs. P. Wigham Richardson [illegible] of the vessel are: Length overall, 351 ft., breadth [illegible]

has been built to take Lloyd's highest class, three deck grade, one deck laid, and to carry a deadweight cargo of about 6,000 tons on a light draught. The machinery has been constructed by the North Eastern Marine Engineering Company, Ltd., Wallsend, and consists of a set of triple expansion engines, having cylinders 23½ in., 39 in. and 66 in. by 45 in. stroke; steam being supplied by two single-ended boilers working at 180 lb. pressure. On leaving the ways the vessel was named the *Enosis*. The following day the same firm launched from their Neptune Yard the fast passenger steamer *Liamone*, which they are building for the mail and passenger service between Nice and Corsica, carried on by Messrs. Fraissinet and Co., of Marseilles. The steamer is a sister ship to the s.s. *Golo*, which was launched from the Neptune Yard last month. She is 273 ft. in length by 34½ ft. beam and is being built under the special survey of the Bureau Veritas and the owners' inspectors. The propelling machinery consists of a set of four crank triple expansion engines on the Yarrow, Schlick and Tweedy system, which, together with the boilers are being constructed at the Neptune Works and are designed

THE HON. THOS. ALLNUT BRASSEY, F.R.G.S., J.P.

PROMINENT as a naval expert, Mr. T. A. Brassey, the only son of Baron Brassey, K.C.B., was born in 1863, educated at Eton, and eventually graduated M.A. at Balliol College, Oxford. He is perhaps best known as the editor and proprietor of the "Naval Annual," which was founded by his father in 1885. He has always taken a keen interest in matters connected with the Navy, and was at one time private secretary to Earl Spencer, then First Lord of the Admiralty. Mr. Brassey is a member of the Admiralty Volunteer Committee, which deals with questions affecting the Royal Naval Volunteer Reserve.

THE HON. THOMAS ALLNUT BRASSEY, F.R.G.S., J.P.
Editor of the "Naval Annual."

The question of Imperial Federation has largely occupied Mr. Brassey's attention and has received his earnest support. Under his auspices, some three years ago, the Federal Union Committee was formed with the object of advocating legislative and administrative devolution applicable to the several countries of the United Kingdom, and the ultimate federation of the Empire for common ends.

Mr. Brassey has contested three Parliamentary seats and on two occasions was defeated by an extremely small majority. As a man of business, especially as the active and energetic managing-director of the extensive lead-smelting works belonging to the Societa di Pertusola, at Spezia, Mr. Brassey has shown marked ability. He is fond of sport of all kinds. At one time he was a yacht owner, and holds the Board of Trade certificate as master for the navigation of his own vessel. He holds the rank of Major in the West Kent Yeomanry, he raised the 69th Sussex Company of Imperial Yeomanry, and in 1900 was the first Acting Civil Commissioner of Pretoria.

According to Mr. H. T. J. Porter at the New York meeting of the American Society of Mechanical Engineers, there are several phases of the human side of the industrial shop that are strictly engineering problems. These are employees' efficiency, records enabling the manager to encourage and keep the best workers and weed out the poor ones. Such records would reveal which men should be given a chance to do better work and also which men in the shop are more capable as acting as instructors to the poorer workmen. The great majority of men who have fallen below the standard of good performance will make a success of their tasks when properly instructed. The second phase of the human side of the shop which should be handled by the engineer is the apprenticeship system.

TRAMWAY BRAKES.

By A. L. C. FELL, M.I.E.E., Chief Officer London County Council Tramways.

THE question of brakes in connection with tramcars has for a long time received the closest attention of tramway engineers and managers, and great improvements have been introduced during the last few years. With light horse and cable tramcars, travelling at a moderate speed, only a hand brake is necessary, but with heavy mechanical traction and higher speeds the necessity for more efficient brakes is recognised.

Railway companies were unable to obtain higher speeds until reliable and efficient brakes had been provided, and in a similar way tramway authorities are now faced with the same problem, although as far as tramways are concerned the development of braking apparatus has been very rapid.

It is now absolutely necessary to obtain sanction for an increase of speed. It is unquestionably somewhat of an anomaly that petrol-driven vehicles are permitted to travel at any speed up to 20 miles per hour, whereas tramcars, which travel in an undeviating line, are not allowed to run at the same speed. The demand for rapid transit is daily increasing, and tramway authorities are fully alive to the fact, but I have drawn attention to this point because as the efficiency [illegible] objections to higher speeds on tramways will disappear.

A very large number of brakes have been developed; the following are the most important types:—

1. Hand Brakes.
2. [illegible]
3. [illegible]
4. Air Brakes.
5. Momentum Brakes.
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]

[illegible] results obtained when making comparative tests with [illegible]

TYPES OF BRAKE.

[illegible]

PEACOCK BRAKE

[illegible] nary hand brake. An arrangement is made with an eccentrically geared cam fixed at the lower end of the ordinary brake spindle; the brake chain is wound round this cam. By means of this apparatus the slack chain can be more quickly wound up and the brakes can be applied more rapidly than with the ordinary hand brake. The cam is so arranged that it is impossible for the chain to overlap and slip. By this arrangement there is less wear on the chain and it is less liable to break. The writer had an opportunity of inspecting this brake in service on the cars in Buffalo, where it apparently gives very good results in the daily service.

MECHANICAL SLIPPER BRAKES

The slipper or mechanical track brake is arranged so that wooden blocks can be depressed on to the rails by means of levers or screws. In my opinion, the mechanical slipper brake is not sufficiently rapid or delicate for an ordinary service brake. When cars are travelling at slow speeds down steep gradients, very excellent steady running results can be obtained by the combination of independent wooden slipper brakes and hand brakes, especially where the gradients are numerous and the cars do not have to run considerable distances through congested traffic, but in London, I believe, the magnetic track brake more nearly fulfils the requirements of rapid transit.

PNEUMATIC SLIPPER BRAKE

An interesting development in connection with [illegible] the slipper blocks are depressed on to the rails by means of compressed air, thus obviating manual labour on the part of the motorman. This is now being tested on several tramways.

[illegible] bracket D attached to the truck. The piston B of the cylinder is connected by a swinging rod G to two levers E E, which have their fulcra on the bracket at e and e. The levers carry the slipper shoe H, on which is fixed a brake block of oak, beech, or other hard wood [illegible] motor-driven compressor. The brake is operated by [illegible] at each end of the car, and there is also a gauge on each platform so that the driver can see at a glance

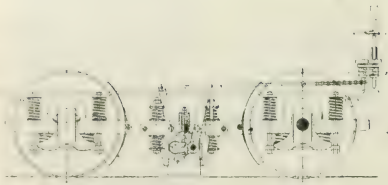


Diagram No. I.—Arrangement of Slipper Brake.

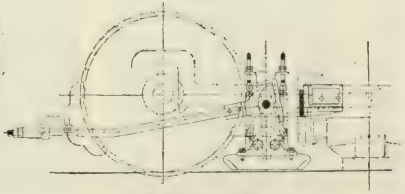


Diagram No. V.—Arrangement of B Type Electro-Magnetic Track Brake.

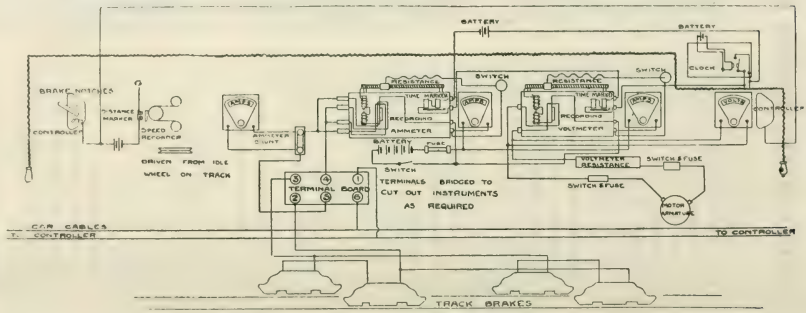


DIAGRAM NO. VI. ARRANGEMENT OF CONNECTION IN BRAKE TESTS.

what pressure he has available at any time. Single truck cars are equipped with two brakes per car and bogie cars with four brakes. The brakes are so constructed that the maximum pressure that can be exerted is less than the total weight of the car, so that the possibility of the car being derailed is minimised.

AIR BRAKES.

Though air brakes have been very generally adopted on railways the application in connection with tramways is somewhat limited in this country, but in other countries where high speeds are allowed, and the conditions of traffic are more favourable, air brakes can be used to greater advantage. The compressor may be driven either directly from the axle by means of an eccentric gearing or chain, or electrically driven by means of a motor carried on the car.

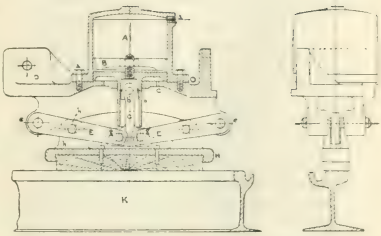


Diagram No. II. Arrangement of Pneumatic Slipper Brake.

MOMENTUM BRAKE

The momentum is a newer form of mechanical brake, which has been adopted to some extent in America, but has not yet been used extensively on the tramway systems in this country. As its name implies the momentum of the moving vehicle regulates the braking effect. The general arrangement of the latest form of this brake is shown on diagram No. 3.

In a momentum brake the force of application is automatically reduced as the speed is decreased, and the ideal conditions in this respect are more nearly obtained with this, than with any other form of mechanical brake. This type of brake is very powerful and can be applied rapidly with small effort on the part of the driver; at the lower speed the retardation is quite equal to that of the other brakes tested on a bogie car, but as the speed rises it becomes rather less effective. One important point is that a momentum brake will give good results without throwing any strain on the costly electrical equipment of the car, but as it is entirely dependent on the weight of the car for its efficacy it does not have the great advantage possessed by magnetic track brakes.

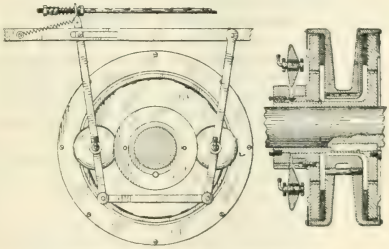


Diagram No. III.—Arrangement of Momentum Brake.

RHEOSTATIC BRAKES.

The next development was the rheostatic brake, where, instead of short-circuiting the motors by one step, a graduated resistance was introduced and better results were obtained. This arrangement is still employed on many electric tramcars. The results obtained with this brake are very poor when compared with those of the electro-magnetic track brakes.

ELECTRO-MAGNETIC DISC BRAKES.

The electro-magnetic disc brake consists of two iron discs, one of which is fixed to the motor frame and the other is keyed to the axle. A coil is embedded in the stationary disc, which is magnetised by connecting the coil, in series, with a rheostat to the motor, when

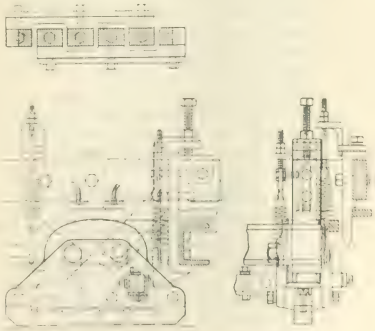


Diagram No. IV.—Magnetic Track Brake, Type A.

acting as generators. By this means braking action is set up by the motors.

(1) The retardation due to the negative torque of the motors acting as generators.

(2) The drag due to eddy currents set up in the revolving brake disc.

(3) The mechanical friction between the revolving and the fixed discs.

The chief disadvantage with this brake is to obtain [illegible] with it at any speed; this makes the action somewhat uncertain, and motormen, when trying to make assurance doubly sure, cut out the whole resistance in circuit with the discs and suddenly short-circuit the motors when running at a high speed and the wheels are locked. The disc brake is very slow in action for any speed under five miles an hour, and is therefore unsuitable as a service brake.

ELECTRO-MAGNETIC TRACK BRAKES.

The recent developments in electro-magnetic track brakes have created a new factor for consideration in the design and equipment of tramway rolling stock, and the aim of tramway engineers and managers is to obtain an apparatus which will combine the functions of both an emergency and an ordinary service brake.

There are at present two types of electro-magnetic track brakes:—

1. Referred to as type A, in which the track shoes act direct on the track only.

2. Referred to as type B, in which the track shoes are coupled to and act in conjunction with the ordinary brake shoes on the wheels.

Type A brake consists of two track shoes, designed as shown on Diagram No. 4. These are rigidly connected together by a cross-bar placed between the side frames of the truck and supported by a pair of tongue-shaped steel brackets bolted to the truck frame and arranged to take the thrust of retardation. A set of spiral springs is provided for supporting the shoes clear of the track. Each shoe is a simple form of magnet, consisting of two steel plates connected by a yoke carrying the exciting coil of the electro magnet. The lower edges of the plates are planed and fitted [illegible]

DIFFERENT TYPES DESCRIBED.

[illegible] to the type B brake is a double track brake, for each truck, also consists of double track shoes of special construction. These are shown on Diagram No. 5, and are arranged in a similar manner to those of the type A brake, but with links and levers for simultaneously transmitting the downward pull and resultant drag of the magnetic track brake to lateral pressure upon the wheels through the ordinary wheel brake [illegible]. A set of spiral springs [illegible] provided for supporting the shoes clear of the track.

In both brakes the exciting coils of each shoe are completely enclosed in water-tight metal cases which effectively prevent any injury to the winding or insulation, through moisture or mechanical abrasion. In each case the electro magnets are energised by current produced by the motors acting as generators, and are strongly attracted to the rails.

In the case of type A brake, the drag resulting from the adhesion of the track shoes to the rails stops the car, whereas with the B type brake this drag also actuates the ordinary brake shoe on the wheels. Both brakes are applied by the same controller handle which is used for operating the car; consequently the motorman can apply the brake in a fraction of a second. The controller is so arranged that the retardation depends upon the position of the handle and the speed at which the car is travelling. Electro-magnetic brakes may be used under all conditions, and are not dependent on the ordinary power supplied from any outside source.

BRAKE TESTS.

Exhaustive tests have been carefully carried out under the many varied conditions which obtain in the daily working of tramways, including the surface variation of the rails caused by the diverse weather conditions. The majority of the trials were carried out after the service cars stopped running on Saturday night and before the cars had commenced running again on Sunday morning, when a clear road free from traffic could be assured. The whole of the comparative trials were, as far as possible, made on the same lengths of line. The trial car was equipped with the following delicate instruments, which were calibrated at the National Physical Laboratory:—

(*a*) A Boyer Speed and Distance Recorder fitted with a [illegible] to indicate the speed [illegible] particular moment.

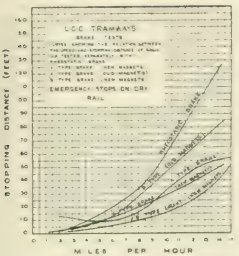
(*b*) A Recording Voltmeter specially constructed for rolling stock tests.

A Recording Ammeter specially constructed for rolling stock tests.

(*d*) A Time Relay Clock, by which marks were made upon the chart of each instrument once every five seconds.

(*e*) A Special Contact fitted to each controller by which a mark was made on the speed distance record immediately the brakes operated by the controller were applied.

In considering the value of any braking apparatus special attention has to be paid to the following particulars, which I have placed in the order of their importance.



POINTS OF RELATIVE IMPORTANCE.

(*a*) Reliability:

[illegible]

Rapidity [illegible]

[illegible] has been applied.

(*c*) Length of time during which the current is passing through the motors and brake coils, viz., the ampere seconds:

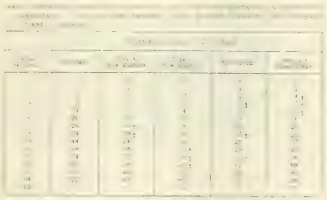
[illegible]

Under the conditions of congested traffic, such as in London, it is of primary importance to have a brake which will stop a car in the shortest possible distance, especially at the lower speeds. I would here point out that the majority of accidents at the present time occur when the cars, not fitted with electro-magnetic track brakes, are running at the lower speeds; but with apparatus which can be more rapidly applied with adequate retarding power, the cars can be stopped in a much shorter distance and before serious damage, if any, occurs. It will be noted, therefore, that, providing the conditions (*a*) and (*b*) are fulfilled, items (*c*) and (*d*) may be taken as a direct measure of the value of the braking apparatus. Condition (*e*) refers to the electrical equipment of the car, and is an indication [illegible] electric or magnetic brakes.

COMPARATIVE RESULTS OF ELECTRO-MAGNETIC BRAKE TESTS.

[illegible] behaviour of the brakes during the tests, I am of opinion that the following are reliable comparisons of the new types of each brake. With regard to the conditions: *a*, "reliability"; *b*, "facility of operation by the motorman"; and *c*, "rapidity of application," [illegible]

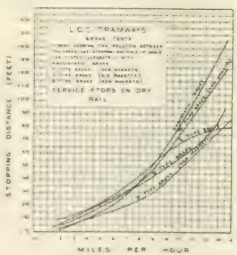
[illegible] "the distance necessary to stop a car after the brake has been applied," on a dry rail up to speeds of 14·5 miles per hour the B type of brake is slightly better, but judging by the curves at higher speeds the A type [illegible] duced from the paper. The results obtained on what appeared to be a greasy rail, show that the B type of brake was more effective, but the results of the tests made are rather better than those which were obtained on a dry rail. This is due, in all probability, to the fact that the brakes were manipulated more skilfully in the later tests. Condition *e* is the next point to consider, viz., "the length of time during which the current is passing through the motors and brake coils, *i.e.*, the ampere seconds." With the B type of brake there is less tendency to overheat the motor armatures, field coils, and resistances.

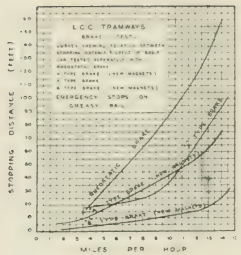


[illegible]

(*a*) The friction between the electro-magnetic brake shoes and the track.

(*b*) The retardation of the wheels due to the motors which they drive acting as generators.





In the case of the type B apparatus, the braking is affected by —

(*a*) The friction of electro-magnetic brake shoes and track.

(*b*) The retardation of the wheels due to the motors which they drive acting as generators.

(*c*) The friction of the wheel brake shoes pressed against the wheel-tyres in direct proportion to the speed at which the car is travelling.

With each brake the energy dissipated in stopping the car in a given time or distance must be the same.

In the case of type A equipment, it is divided as follows:

In wear between the magnetic brake shoes and the rails.

In wear between the pinions and gear wheels.

In heating the armatures, fields, and resistances.

In the B type of brake equipment the energy is dissipated

In wear between the magnetic brake shoes and the rails.

In wear between the pinions and gear wheels.

In heating the armatures, fields, and resistances.

In wear between the wheel-brake, shoes, and tyres.

GENERAL CONCLUSIONS

It is quite clear from the results of the tests that the hand and rheostatic brakes are not to be compared with the results obtained with electro-magnetic track brakes. Hand brakes are too slow in action, and entail much unnecessary labour on the part of the motormen. Rheostatic brakes are cheap as regards first cost, but the maintenance charges owing to the short life of the motors and resistances are very much increased. With this type of brake the efficiency is very low and the power developed by the motors can be used to a much greater advantage in connection with magnetic track brakes. The tests made with the magnetic track brakes demonstrate this point very clearly.

MOMENTUM BRAKE RESULTS

The results obtained with the momentum brake are very good and should receive careful consideration. I think that the pneumatic slipper brake for use on long steep gradients is a development which will be watched with interest.

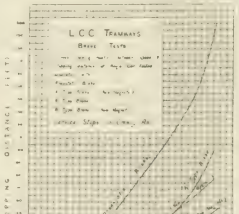
The trials with both the A and B types of magnetic track brake show excellent results, and, although as far as the tests are concerned, there is no doubt that the latest form of type B brake, with the supplementary wheel brake attachment, gave the best results, there are two important points which must also be taken into consideration, viz., the first cost and the cost of maintenance.

The cost of the A type of brake is naturally much lower than that of the B type of brake, as the arrangement is simpler, and for the same reason, in all probability, the cost of maintenance of the A type will be less as there are fewer working parts. It is therefore a question of experience as to whether the cheaper brake is sufficiently good for all practical purposes. Speaking personally, after a short experience, so many good points have been found in both types of brake that we are now giving them a thorough practical test under ordinary working conditions. I consider that even with electro-magnetic track brakes there is room for improvement, and shall not feel satisfied until a supplementary attachment is provided, so that the magnetic track-brake shoes can be operated by hand if necessary.

IMPROVED BRAKES AND INCREASED SPEEDS.

It is quite clear that the Board of Trade recognise the importance of increased speeds, but at the same time the safety of the public has to be taken into consideration. If I may be allowed to say so, I consider the procedure adopted by the Board of Trade very reasonable.

When the L.C.C. electric tramways were originally



inspected by the Board of Trade, the following speeds were allowed :—

Percentage of total length of track	...	...	23·7	37·55	17·5	4·3	25
At miles per hour	12				9	4	

But after the foregoing series of tests had been carried out, and it was ascertained that excellent results could be obtained with the latest forms of electro-magnetic track brakes, an application was made to the Board of Trade for an increase of speed. Practically the whole of the tramways were then re-inspected, and the Board are prepared to approve the following speeds on condition that the cars are fitted with electro-magnetic track brakes :—

Percentage of total length of track	...	...	28·44	51·40	18·5	2·1
At miles per hour			12		9	4

The increase in speed thus secured by more effective braking apparatus possesses very far reaching advantages. A better service can be given with a fewer number of cars, so that the capital outlay on cars and car-sheds, etc., is reduced; also the cost of operation per car mile is very much reduced, as fewer motormen, conductors, inspectors and cleaners are required. The cost of upkeep per car is somewhat higher, but as a fewer number of cars are in service the total cost is not greater.

ADVANTAGES OF ELECTRO-MAGNETIC BRAKE.

The chief advantage of the latest forms of electro-magnetic brake is that they can be used in the thickest traffic when the cars are travelling at very low speeds. In the improved designs, with longer magnets, the ampere seconds are very much lower, and the motors are not over-heated, as was the case with the older forms of magnets.

If these brakes are adopted several very important points require attention. In the first place the controller should be designed with not less than seven brake notches, so that the brakes may be applied gradually; also that the brake connections in the controller are entirely disconnected from the power circuit. The controller connections have to be arranged specially, so that when one motor is cut out the brake-winding will not be short-circuited. It must be remembered that electro-magnetic track brakes are useless if applied at junctions where manganese rails and special work are used throughout. It is also essential that the cars to which these brakes are fixed should be substantially built, especially when roof covers are fitted, as the strain caused by the rapid application of the brake when the cars are travelling at high speeds may develop serious defects.

Abstract of paper [illegible] the Tramways and Light Railway Association

OPENINGS FOR TRADE ABROAD.

Transvaal.

The Municipality of Pretoria are calling for tenders, which will be received up to 15th March, for the supply and erection of a refuse destructor capable of treating 60 tons daily. Particulars can be obtained from Messrs. Mosenthal, Sons and Co., 72, Basinghall-street, E.C.

Spain.

A decree has been published sanctioning the expenditure of [illegible] pesetas (about £204,722) on works at the port of San Esteban de Pravia, including the construction of a mole at the mouth of the river Nalon, the amelioration of the bed of the river, and the improvement of the dock.

Belgium.

Tenders which will be opened on the 7th prox. are invited by the "Société Nationale des Chemins de Fer Vicinaux," for the construction of the line from Etalle to Bellefontaine, and the alteration of Etalle station. The estimated cost of the work is £12,120. A copy of the specifications may be obtained from M. Alliaume, rue de Luxembourg, 80, Arlon.

British India.

Among the railway extensions for which the Bengal Government are at present acquiring land are the following: In the Hooghly district on behalf of the Howrah-Amta Light Railway Company for the extension of the railway from Autpore to Campadanga, and in the Santhal Parganas and Murshidabad districts for the construction of a railway from Barharwa to the Dhulian river-side. Both of the proposed lines will serve a large number of villages, not hitherto within easy reach of railway communication.

Netherlands.

The Commercial Intelligence Branch of the Board of Trade have been notified by H.M. Consul at Rotterdam that tenders will be received up to the 23rd of January for the construction and delivery, in complete working order, of an iron repairing stage for the dry-docks I., II. and III. on the left side of the River Maas [illegible] consists of [illegible] 60 metres [illegible] metres [illegible] at top [illegible] metres [illegible] depth at centre, 2.21 meters; depth at ends, 2.44 metres. Delivery is to be made on or before October 1st, 1906. Further particulars can be obtained from Messrs. P. van Waesberge and Zoon, Rotterdam.

CONTRACTORS' NEWS.

We shall be pleased to insert under this column, free of charge, particulars of open contracts

CONTRACTS OPEN.

Wimbledon.—Supply and fixing of air compressors, to be electrically driven, at the pumping station, Durnsford-road, Wimbledon, for the Wimbledon Corporation. Mr. C. H. Cooper, M.Inst.C.E., Town Hall, Wimbledon ... ... Last Day Jan. 22

King's Norton.—About 1,200 yards of wrought-iron railing for enclosing recreation ground in Franklin Road, King's Norton, for the King's Norton and Northfield Urban District Council. Mr. Ambrose W. Cross, A.M.Inst.C.E., 23, Valentine Road, King's Heath... ... ... Jan. 22

London, E.—Reconstruction of a swing-bridge carrying Old Gravel Lane over the entrance to the East London Dock, in the metropolitan borough of Stepney, for the London County Council. Mr. Maurice Fitzmaurice, C.M.G., County Hall, Spring Gardens, S.W. ... ... Jan 23

Great Northern Railway.—Construction of Contract No. 1 from Enfield to Cuffley, being a length of five miles or thereabouts, for the Great Northern Railway Company. Engineer of the Company, King's Cross Station, London, N. ... ... Jan. 23

Huddersfield.—The following works, for the Corporation—viz: (Contract No 1) intercepting sewer, sedimentation tanks, detritus tanks, bacteria beds and other works contingent thereon; (Contract No. 2) gas-plants, gas-engines, generators, air-compressors and motors, pumps and motors, sludge pumps, switchboard, etc.; (Contract No. 3) sewage screen and elevator; (Contract No. 4) sewage discharge recorder; (Contract No. 5) sewage distributors and cables. Mr. K. F. Campbell, Engineer to the Corporation ... .. Jan. 27

London. N.—Roadwork and platelaying for the reconstruction for electrical traction on the conduit system of the first portion of the Council's (northern) tramways, comprising the routes from Bloomsbury to Poplar, and in Kingsland-road, from Old-street to Stamford Hill, together with short terminal lines in connection therewith, for the London County Council. Clerk to London County Council, Spring Gardens, S.W. ... ... Jan. 30

Kilmarnock.—Excavation, concrete work, steelwork, timber work, and other contingent works in forming railway into Riverbank gas and electricity works, for the Kilmarnock Corporation. Mr. Chas. Fairweather, joint engineer, Corporation Gas Offices, Kilmarnock ... ... Jan. 30

Culham (Oxon).—Reconstruction of a portion of Nuneham viaduct over the River Thames, near Culham Station, for the Great Western Railway Company. The Engineer at Paddington Station ... Last Day Jan. 30

Stoke upon Trent.—Supply and delivery of meters and demand indicators during year ending March 31, 1907, for the Electricity Committee. Mr. P. J. S. Tiddeman, borough electrical engineer, Electricity Works, Stoke-upon-Trent ... Jan. 31

London.—For the following plant and materials for the Battersea Borough Council: (1) one set either 750-850-k.w. or 1,000-k.w. direct-current 400 to 550 volts steam generator, piping, and ejector condenser; (2) arc lamp columns; (3) arc lamps; (4) arc lamp globes. The Chief Engineer, Electricity Department, Lombard Road, Battersea ... ... Feb. 5

Sparkhill (Birmingham).—Provision and construction of the following approximate lengths of surface-water sewers, for the Yardley Rural District Council—viz.: 992 yds. of 24-in., 130 yds. of 21-in., 260 yds. of 18-in., 231 yds. of 15-in., 103 yds. of 12-in., and 480 yds. of 9-in. pipe sewer; also of the following approximate lengths of foul-water sewers: 480 yds. of 15-in. and 233 yds. of 12-in. pipe sewer—together with manholes, lamp-holes, flushing shafts, and other works appertaining thereto. Mr. Arthur W. Smith, Council House, Sparkhill ... ... Feb. 7

Arkley (Herts).—Covered service reservoir capable of holding about two million gallons, to be constructed on the company's land at Arkley, Hertfordshire, for the Barnet District Gas and Water Company. Mr. T. H. Martin, A.M.Inst. C.E., engineer and manager, Station Road, New Barnet ... ... Feb. 27

COMING CONTRACTS.

Barnes.—The Council has just decided to put down additional plant, including a 300 k.w. steam dynamo, boiler, feed pump, etc., at an estimated cost of £4,700, and to apply for sanction to borrow this sum.

Walsall.—To meet the increasing demand for current for lighting and power, the Electricity committee recommend the council to apply for sanction to a further loan of £13,000 for additional generating plant and mains extensions.

Llanelly.—An inquiry is to be held into the application for permission to borrow £6,000 in connection with the electric lighting scheme.

Burslem.—Sanction has been received to the borrowing of £5,000 to provide new purifiers at the gas works.

Hammersmith.—Considerable extensions of electric lighting are contemplated and orders are to be given out for additional electrical generating machinery.

CONTRACTS CLOSED.

Natal.—The Fulham Steel Works Company, Ltd., of Townsmead Road, Fulham, have been entrusted by the Natal Government with a very important contract in connection with the new harbour works at Durban. The contract covers the manufacture and erection of extensive plant for the handling and shipment of coal raised in the mines of the Colony, and comprises machinery of the most modern type, and on a scale larger than has been attempted in this country. Designs were submitted in competition with manufacturers in France, Germany, and America.

London. — The Brush Electrical Engineering Company, Ltd., have received the following contracts: Malta (per Macartney, McElroy and Co.), five tramcar bodies; Adelaide (per Electric Lighting and Traction Company of Australia), ten 10-k.w. transformers, and five 5-k.w. transformers; and Warrington, 100-k.w. three-phase motor alternator, one 150-k.w. transformer, and two 30-k.w. transformers.

Glasgow.—Messrs. Babcock and Wilcox, Ltd., have received orders for 28 large boilers for Messrs. Kosmoid, Ltd., and for three large boilers for Messrs. David Colville and Sons, Ltd., of Motherwell.

Johannesburg. — The Johannesburg Corporation have placed contracts with Weightman and Amery for construction of street islands for tramway poles, (£3,539); C. Jowett and Co., for tramway construction work, etc., (£12,915); Gloucester Railway Carriage and Wagon Company for bodies, and Dick, Kerr and Co., for trucks, wheels, axles and electrical equipment for three electric freight cars (total cost £1,800); British Insulated and Helsby Cables, 200 ft. of 4-in. by ¼-in. copper strip; and Pilkington Brothers for rolled glass. The Corporation have also confirmed their contract with Dick, Kerr and Co. for supply of 100 electric cars.

Salford.—The Council have accepted the following tenders: Bowes, Scott and Western, water-softening plant, £740; F. M. Burley, wiring Higher Grade School for Girls; Key Engineering Company, joint fibre conduit.

Ilford.—The District Council have accepted a tender of Johnson and Phillips for 0·5-in. triple-concentric armoured cable at £1,089 9s.

Croydon.—The Corporation have accepted the tender of Dick, Kerr and Co., for a 1,000-k.w. direct-current generator at £[illegible].

Newcastle.—The Rural Council of Newcastle has accepted the tender of Mr. W. T. Wear, of Howdon, for the construction of a great culvert through the Ouseburn Valley, in preparation for the work of filling in the valley, which is to follow.

Bengal.—Messrs. Bolckow, Vaughan and Co., Ltd., have been awarded an important contract for supplying no fewer than 13,000 tons of steel rails required by the Bengal-Nagpur Railway, which operates 1,976 miles of track, and is one of the most important railway systems in the Indian Empire. Early delivery was an important factor in placing the order with the Cleveland firm, as the whole of the rails are to be delivered at Kharagpur in the course of five months.

APPOINTMENTS VACANT.

Oldham.— The Corporation Electricity Committee invite applications for the position of junior assistant electrical engineer. Mr. S. Wilmott Newington, Borough Electrical Engineer, Oldham ... Jan. 22

London.—Directors of the Burma Railway Co. invite applications for appointment as temporary assistant engineer in the way and works department in Burma. Salary, up to Rs. 400 per mensem. Mr. A. G. Begbie, managing director, 199, Gresham House, Old Broad Street, London, E.C. ... Jan. 24

Swadlincote.—As surveyor and water engineer under the Urban District Council. The salary as surveyor will be £250 per annum, and as water engineer to the Joint Water Committee of Swadlincote and Ashby-de-la-Zouch £50 per annum. Mr. W. A. Musson, clerk, Swadlincote, Ashby-de-la-Zouch ... ... Jan. 31

Birmingham.—The King's Norton and Northfield Urban District Council invite applications for the appointment of first assistant engineer and surveyor to the Council. Salary £180 per annum, rising by biennial increments of £10 to £200. Mr. Edwin Docker, 10, Newhall Street, Birmingham ... ... Feb. 1

Auckland, New Zealand.—Applications are invited for the appointment of City Engineer to the City of Auckland. High Commissioner for New Zealand, Westminster Chambers, 13, Victoria Street, London, S.W. ... Feb. 8

APPOINTMENTS FILLED.

St. Helens. Mr. R. M. Moore, station superintendent at St. Helens, has been appointed traffic superintendent at £[illegible] per annum in succession to Mr. C. White, resigned.

Johannesburg. Dr. R. A. Lehfeldt, professor of physics at the East London Technical College, has been appointed professor of physics at the Transvaal Technical Institute, Johannesburg.

West Ham.—The Council have appointed Mr. Eastace as deputy electrical engineer at a salary of £[illegible].

Doncaster.—Mr. F. Oscar Kirby has been temporarily appointed borough surveyor and waterworks engineer under Doncaster Corporation.

Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire it to be understood that while our Share List will generally be found correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies

STOCK EXCHANGE SETTLING DAYS.—Settling days on the Stock Exchange are as follows:—
Consols: Feb. 1st. General Settlements: Jan. 25th; Feb 8th, 22nd. Bank Rate, September 28th, 1905, 4 per cent.

I.—ENGINEERING, IRON, AND STEEL COMPANIES.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up	Closing Prices
11,370	3	5%	Alldays & Onions Pneumatic Engineering, Ltd.	3	2¾— 3
10,000	5	3/-	Do. Cum. Pref. 6 per cent. ..	5	4¾ — 5
8,210,000	1	1/-	Armstrong (Sir W. G.), Whitworth and Co., Ltd.	1	3 3/16 — 3 5/16
76,970	5	2/-	Do. 4% Cum. Pref.. ..	5	5½— 5⅝
1,500,000	100	4%	Do. 4% 1st Mort. Dbs. Rd.	100	101—103
£100,000	100	4½%	Aveling and Porter, Ltd., 4½% Reg. Mt. Debs. Red.	100	94 - 97
580,000	1	1/7½	Babcock and Wilcox, Ltd., Ord. ..	1	3¾— 4
100,000	1	7⅛d.	Do. „ 6% Cum. Pref.	1	1 7/16 — 1 9/16
20,000	5	3/-	Baker (Joseph) and Sons, Ltd., 6% Cum. Pref.	5	5 — 5½
250,000	1	6⅝d.	Baldwins, Ltd., 5½% Cum. Pref. ..	1	1 1/16 — 1 3/16
£250,000	Stk	4½%	Do. 1st Mt. 4½% Deb. Stk. Red.	100	104—108
150,000	4½	3/	Barrow Hæmatite Steel Co., Ld., O.	4½	5 — 5¼
60,000	4½	3/-	Do. do. Cum 2nd. Pref.	4½	5 — 5¼
83,334	5	2/6	Bayliss, Jones and Bayliss, Ltd., 5% Cum. Pref. Shares	5	4¾—5¼
£500,000	100	4½%	Beardmore (Wm.) & Co., Ltd. 4½% 1st Mt. Debs., Red., Scrip 50% pd	—	104 / 104 106
50,000	10	6/-	Bell Brothers, Ltd., 6% Cum. Pref.	10	12¾—13¼
£866,600	Stk	4%	Do 4% Deb. Stock, Red.	100	99—101
200,000	1	1/-	Beyer, Peacock and Co., Ltd., Ord.	1	[illegible]
300,000	1	6⅞d.	Do. 5½% Cum Pref.	1	[illegible]*
£800,000	Stk	4½%	Do. 4½% Red. Deb. Stock	100	91—94
1,629,760	1	6d.	Bolckow, Vaughan and Co., Ltd., O. Nos. 1-1,629,760	1	1⅛—1 [illegible]
1,860,900	1	3¾d.	Do. Nos. 1,639,101-3,500,000	12/-	19/32—21/32
1,160,000	1	4½d.	Brown (John) and Co., Lim., Ord., Nos. 1-1,160,000	15/-	1⅜—1½
590,000	1	6d.	Do. Ord., Nos. 1,160,001-1,750,000	1	1⅞—2
74,000	10	5/-	Do. 5% Cum. Pref.	10	11¾—12¼
154,500	5	2/6	Cammell, Laird & Co., Ltd., Ord. ..	5	10 —10½
282,500	5	2/6	Do. 5% Cum. Pref. ..	5	5½— 5¾
450,000	1	1/2½	Clayton & Shuttleworth, Ltd., Ord.	1	31/32—1 1/32
70,000	5	2/6	Do. 5% Cum. Pref	5	5⅛— 5⅝
£250,000	Stk	4%	Do 4% 1st Mort. Db. Stk. Red	100	99 -101
100,000	10	30/-	Consett Iron Co., Ltd., Ord.. .	7½	36½— 37½
57 031	10	10/	Crossley, Bros., Ld, Ord. 40840/97370	10	15⅛ -15¾
40,339	10	5%	Do 5% Cum Pref.	10	11½—11¾
75,000	1	2/6	Delta Metal, Ltd. Shares	1	2 — 2¼
1,259,594	1	3½d.	Dorman, Long & Co., Ltd.	1	⅝ 11/16
£400,000	Stk	4%	Do. 4% 1st Mort. Perp. Deb. Stk.	100	92—95
200,000	5	3/	Dunderland Iron Ore Co., Ltd., 6% Cum. Pref. and Participating..	5	3¾— 4¼
250,000	1	9½d.	Dunlop (James) & Co., Ltd., Ord...	1	[illegible]
800,000	1	7½d	Do. 6% Cum. Pref. ..	1	[illegible]
4,721	13	13	Ebbw Vale Steel, Iron & Coal Co., Ltd.	13	10¾— 11½
69,754	13	10/-	Do. do. do.	10	9 — 9½
20,250	10	8	Elliott's Metal, Ltd.	8	5— 5½
5,000	10	5%	Do. Cum. Pref. 5%	10	8½ 9*
186,748	Stk	4	Do. Deb. 4%	100	93—95
25,000	10	6/-	Fairfield Shipbuilding & Engng.Co., Ltd., 6% Cum. Pref. ..	10	11¼—11¾
£250,000	Stk	4½	Do. 4½% Mort. Deb. Stk. Red.	100	100 -103
126,000	3	2/4	Fraser & Chalmers, Ltd., Ord ..	3	3¾ 4¼
21,000	3	1/-	Do. 7½% Cum. Pref.	3	5¼ [illegible]
10,000	10	5%	Galloways, Ltd., 5% Cum. Pref. 18001/28000	10	7½— 7¾*
£150,000	Stk	4	Do. 4% 1st Mort Deb Red..	100	86 — 87*
16,800	10	16	Greenwood & Batley, Ltd., Ord. ..	10	6¾ 7
9,600	10	7%	Do. 7% Cum. Pref.	10	10¾ 11¼
965,000	1	1/-	Guest, Keen & Nettlefolds, Ltd. Ord.	1	[illegible]
344,000	5	2/6	Do. 5% Cum. Pref. ..	5	6⅛— 6⅜
£1,850,500	Stk	4%	Do. 4% Irred. Mort. Deb. Stk	100	104 105
13,000	5	2/6	Gwynnes, Ltd., 5% Cum. Pref. ..	5	2¾ 3¼
250,000	1	1/	Hadfield's Steel F'dry Co., Ld., Ord.	1	3¾ 4
20,000	10	4/6	Do. 4½% Cum. Pref.	10	10¾—11
30,000	5	3/-	Hall (J. & E.), Ltd. 6% Cum. Pref...	5	4¾ 5¼
408,505	1	1/6	Harvey United Steel Co., Ltd. ..	1	⅞— 1
47,500	10	7½	Hawthorn. Leslie & Co., Ltd. Ord.	10	9¾—10½
28,000	5	7/	Head, Wrightson & Co., Ltd.	5	5½— 6
85,000	1	7½d.	Hill (Richard) & Co. (1899) Ld., Ord.	1	[illegible]
18,000	5	3/	Do. 6% Cum. Pref. ..	5	5 5½
£100,000	Stk	6%	Hornsby Richard & Sons, Ld., Ord. 6% Cum. Pref.	100	103 105

ENGINEERING, IRON, AND STEEL COMPANIES.—*Contd.*

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up	Closing Prices
750,000	1	6d.	Howard & Bullough, Ltd., Ord. ..	1	1½—1⅝
25,000	10	6/-	Do. 6% Pref. (Non-Cum.) ..	10	12¼—12¾
£250,000	Stk	4%	Do. 4% Deb. Stk., Red. after 1905	100	96 —99
37,500	10	20	Kynoch, Ltd.	10	18 —18½
49,537	10	5%	Do. Cum. Pref. 5%	10	10½—10¾
300,000	1	4½d	Lambert Bros., Ltd., Ord.	1	⅝—⅞
50,000	5	2/9	Do. 5½% Cum. Pref.	5	4 —4½
40,000	3	2/1½	Leeds Forge Co., 7% Cum. Pref. ..	3	4 - 4½
200,000	1	7½d.	Lysaght (John), Ltd., 6% Cum. Pf.	1	1⅜—1½
£300,000	Stk	4½%	Do 4½% 1st Mt. Deb. Stk., Red.	100	108 —110
40,000	10	5/-	Mather & Platt, Ld., 5% Cum. Pref	10	11¾—12¼
210,000	1	8⅝d.	Measures Bros., Ltd., Ord.	1	[illegible]
75,000	1	6⅞d.	Do. 5½% Cum. Pref.	1	1 — 1⅛
£75,000	Stk	4½%	Do. 4½% 1st Mrt. Db. Stk., Red.	100	98 — 101
21,943	5	2/6	Muntz Metal, Ltd.	5	4¾— 5¼
14,248	5	5%	Do. Pref. 5%	5	4¾— 5¼
5,000	62½	47/6	Nantyglo and Blaina Iron Works, Ltd., 8% Cum. Pref.	62½	79 — 82
73,000	10	5/-	N. Brit. Loco. Co., Ltd., 5% Cm. Pf.	10	12⅜—12⅝
80,000	5	—	North-Eastern Steel Co., Ltd.,		
£250,000	Stk	4½%	4½% 1st Mrt. Db. Stk., Red.	100	87 — 91
122,000	5	1/6	Pearson & Knowles Coal and Iron Co., Ltd., Ord., "B"	5	4⅞— 5⅛
50,000	5	3/-	Do. 6% Cum. Pref. "A" ..	5	6 — 6½
70,000	10	10/-	Pease & Partners, Ltd., Ord. ..	10	18¾—13¾
£400,000	Stk	4%	Do. 4% Perp. Deb. Stock ..	100	99—102
20,000	5	3/-	Peebles (Bruce) & Co., Ld., 6% Cm.P.	5	4⅞— 5⅛
65,000	1	—	Pooley (Henry) & Son., Ltd., Ord ..	1	10/3—10/9
13,000	5	—	Do. 5½% Cum. Pref.	5	4⅜— 4⅞
230,000	1	—	Projectile Co. (1902), Ltd., Ord. ..	1	[illegible]
126,938	5	2/-	Rhymney Iron Co., Ltd.	5	2 — 2⅛
73,062	5	2/-	Do. New	5	[illegible]
£330,000	—	5%	Do. 5% Mort. Deb., Red. ..	100	99—101
350,000	1	1/2½	Richardsons, Westgarth & Co., Ltd., Ord. 350,001—700,000 ..	1	[illegible]— 1
£350,000	1	7⅛	Do. 6% Cum. Pref.	1	15/16—1 1/16
£350,000	Stk	4½%	Do. 4½% Perp. Deb. Stock ..	100	100—102
35,000	10	12/-	Ruston, Proctor & Co., Ltd... ..	10	10½— 11
275 000	1	6d.	Scott (Walter) Ltd., Ord.	1	[illegible]
800,000	1	7½d.	Do. 6% Cum. Pref. ..	1	1 —1 1/16
£300,000	Stk	4%	Do. 4% Perp. Deb. Stk.	100	92 —95
£115,300	100	5%	Shelton Iron, Steel and Coal Co., Ld. 1st Charge 5% Debs.. Red ..	100	92 — 95
£97,900	100	6%	Do. 6% 2nd Mort. Debs., Red.	100	96 —100
250,000	1	1/-	South Durham Steel & Iron, Ltd. Or.	1	[illegible]— 1⅛
300,000	1	1/2½	Do. 6% Cum. Pref...	1	15/16—1 1/16
£300,000	Stk	4½%	Do. 4½% Per. Deb. Stock	100	93 — 96
25,000	10	—	Stephenson (Robert) & Co., Ltd., Or.	10	2¾— 3⅛
25,000	10	5/6	Do. 5½% Cum. Pref.	10	5¾— 6¼
£250,000	Stk	4%	Do. 4% Perp. Deb. Stock	100	81— 84
85,000	10	9/-	Stewarts & Lloyds, Ltd., Ord. ..	10	18¾— 19¼
55,000	10	6/-	Do. 6% Cum. Pref. ..	10	14½— 15
634,732	1	6d.	Swan, Hunter & Wigham-Richardson, Lim. Ord.	1	⅞ —15/16
538,845	1	6d.	Do. 5% Cum. Pref.	1	[illegible]—1 1/16
£240,000	Stk	4½%	Do. 4½% 1st Mort. Deb Stk. Red	100	96 — 99
300,000	1	6d.	Thames Iron Works, Shipbuilding & Engineering Co., Ltd., 5% Cum. Pf.	1	13/16—15/16
£200,000	100	4%	Do. 4% Irredeem. 1st Mort. Deb.	100	80 — 84
£148,500	1	7½d.	Thornycroft (John I.) & Co., Ltd. Or.	1	[illegible]
£160,000	1	7½d.	Do. do. 6% Cum. Pref.	1	⅞ — 1
10,000	10	5/-	Tylor (J.) & Sons, Ltd. 5% Cum. Pf.	10	9 — 9½
$508495200	$100	$½	United States Steel Corp. Com. Stk.	$100	46 —46¼
$360314100	$100	$1¾	Do. 7% Cum. Pref. Stock	$100	112½—112¾
$162268000	$1000	5%	Do. 10-60yr. 5% Skg. Fd. G. Bds.	$1000	101—103
3,350,000	1	1/	Vickers, Sons & Maxim, Ltd. Ord..	1	2 [illegible] - 2 [illegible]
750,000	1	6d.	Do. 5% Non-Cum. Pref.	1	1 1/16— 1 3/16
£750,000	Stk	5%	Do. 5% Non-Cum. Pref. Stock.	100	121 —124
£1,250,000	Stk	4%	Do. 4% 1st. Mort. Deb. Stk. Red.	100	103 —105
£1,000,000	100	4½%	Do. 4½% 2nd Mort. Debs., Red.	100	104 -106
225,000	1	1/2½	Weardale Steel, Coal & Coke, Ltd., Def. Ord.	1	[illegible]
500,000	1	7½d	Do. 6% Cum. Pref. Ord. ..	1	[illegible]
£300,000	Stk	4%	Do. 4% Perpetual Deb. Stock	100	92 — 95
66,666	5	3/-	Willans & Robinson, Ord.	5	2 — 2½
66,666	5	3/-	Do. 6% Cum. Pref.	5	4 — 4½
£216,641	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red	100	82 — 87
£150,000	Stk	4½	Yorkshire Iron & Coal Co., Ltd., 4½% 1st Mort. Deb. Stk. Red.	10	77 —79

Stocks and Shares marked * are quoted ex-dividend

II.—ELECTRICAL MANUFACTURING COMPANIES.

Present Amount Subscribed	Shares.	Last Dividend.	Name	Paid up	Closing Prices.
70,000	1	6d.	Alliance Elec. Co., Ltd. 5% Cum. Pf.	1	⅝— ⅞
125,000	1	7½d.	Aron Elec. Meter Ltd., 6% Cum. Pf.	1	½— ⅝
120,000	1	1/2⅜	Bell's Asbestos Co., Ltd.	1	1 7/16—1 9/16
£40,000	5	9d	British Aluminium Co. 7% Cum Pref.	5	5½— 6
£300,000	Stk	5%	Do 5% 1st Mort. Deb. Stk. Rd.	100	98—102
100,000	5	4/-	British Insulated & Helsby Cables Ltd., Ord. ..	5	6¾— 7¼
100,000	5	3/-	Do. 6% Cum. Pref.	5	6 — 6½
£500,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Rd.	100	103 —106
£200,000	Stk	4½%	British Thomson-Houston Co., Ltd., 4½% 1st Mort. Deb. Stk. Red. ..	100	98—100
400,000	5	8/-	British Westinghouse Electric and Manufac. Co., Ltd., 8% Pref. ...	5	1¾— 2¼
£616,358	Stk	4%	Do. 4% Mort. Deb. Stk. Red...	100	77 — 82
105,731	2	2/-	Brush Elec. Enging. Co., Ltd., Ord..	2	⅜— ⅝
150,000	2	2 4⅘	Do. 6% Pref.	2	1¼— 1¾
£125,000	Stk	4½%	Do. 4½% Perp 1st Deb. Stk...	100	99 —101
£125,000	Stk	4½%	Do. 4½% Perp. 2nd Deb. Stk.	100	82 — 84
35,000	5	5/-	Callender's Cable & Constn. Ltd. Ord.	5	11 — 12
40,000	5	2/6	Do. 5% Cum. Pref.	5	5⅜ – 5⅞*
£200,000	Stk	4½%	Do. 4½% 1st Mort. Deb Stk. Red.	100	108 —110
85,000	3	1/6	Crompton & Co., Ltd...	3	1⅞ – 2⅛
£100,000	—	5%	Do. 5% 1st Mort. Reg. Debs.	100	95 – 98%
52,000	5	10/-	Dick, Kerr & Co., Ltd., Ord. ..	5	8½— 9
61,000	5	3/-	Do. 6% Cum. Pref.	5	5¾— 6¼
£300,000	Stk	4½%	Do. 4½% Deb. Stock, Red. ..	100	104 —106
233,334	1	6d.	Doulton & Co., Ltd., 5% Cum. Pref.	1	1⅛— 1⅜
£233,334	Stk	4%	Do. 1st Mort. 4% Iree. Deb. Stk.	100	106 —109
99,261	5	1/6	Edison and Swan United Electric Light, Ltd., "A" Shares Nos. 1-99,261	3	1⅜— 1⅝
17,139	5	2/6	Do. "A" Shares Nos. 01-017,139	5	2¼— 2¾
£344,023	Stk	4%	Do. 4% Deb. Stock Red. ..	100	86 — 88
£100,000	Stk	5%	Do. 5% Second Deb. Stk. Red.	100	92— 97
112,100	2	1 7⅗	Electric Construction Co. Ltd. ..	2	½— ¾
31,390	2	2 9⅗	Do. 7% Cumulative Pref. ..	2	1⅝— 2⅛
£200,000	Stk	4%	Do. 4% Perp. 1st Mt. Deb. Stk.	100	90 — 95*
10,248	10	7/6	Evered and Co., Ltd... ..	10	9 — 11
25,000	10	5/-	Gen. Elect. Co. (1900), Ltd., 5% Cum. Pref.	10	9 – 9½
£200,000	Stk	4%	Do. 4% 1st Mt. Deb. Stk., Red.	100	96—100
35,000	5	5/-	Henley's (W. T.) Telegraph Works Co., Ltd., Ord.	5	12½—13½
35,000	5	2/3	Do. 4½% Cum. Pref.	5	5¼— 5½
£50,000	Stk	4½%	Do. 4½% Mt. Deb. Stk. Red.	100	—
50,000	10	15/-	India Rubber, Gutta Percha & Telegraph Works Co., Ltd.,	10	18½ – 19½
£300,000	100	4%	Do. 1st Mort. Deb. Red. ..	100	99 —102
7,500	10	—	Parker, Thos. Ltd.	10	6½ – 7
100,000	1	8%	Scott (Ernest) & Mountain, Ld., Ord.	1	17/8—17/9
37,350	12	12/-	Telegraph Construction and Maintenance Co., Ltd.	12	33½ 34½
150,000	100	4%	Do. 4% Deb. Bonds	100	100 102

III.—ELECTRIC TRACTION.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up	Closing Prices
120,000	5	3/-	Anglo Argentine Trams Co., Ld., Or.	5	8 3/16— 8 7/16
260,007	5	2/6	Do. 5% Cum Pf.	5	5¾— 6
£230,000	Stk	6%	Do Permanent 6% Debenture Stock, 1888 ..	100	140 143
20,000	10	12/-	Barcelona Trams Co., Ltd., Ord. ..	10	13¾ – 14½
10,000	10	5/-	Do. 5% Cum Pf. Shares	10	9½ – 10
£46,800	100	5%	Do. 5% Debs., Red. ..	100	98 – 101
£191,326	Stk	4½%	Do. 4½% Red. Deb. Stk.	100	97 —102
75,606	1	—	Bath Elec. Trams. Ld., Pf. Or.	1	[illegible]
59,394	1	6d.	Do. 5% Cum. Pf. ..	1	15/16 – 1 1/16
75,000	5	—	Brisbane Electric Tram Investment Co., Ltd., Ord... ..	5	1 — 1½
75,000	5	2/6	Do. 5% Cum. Pf. ..	5	3¾— 4¼
£425,000	Stk	4½%	Do. 4½% 1st Deb. Stk., Red.	100	93 – 96
£200,000	Stk	6%	Brit. Columbia Elec. Rly. Co., Ltd., Def. Ord. Stock	100	120 123
		5%	Pref. Ord. Stock	100	110—118
139,301	10	6/-	Brit. Electric Traction, Ltd., Ord.	10	8⅜ 8¾
156,487	10	6/-	Do. 6% Cum. Pref.	10	10⅞ – 11⅜
£1,000,000	Stk	5%	Do. 5% Perp. Deb. Stk. ..	100	119 – 121
£250,000	Stk	4½%	Do. 4½% 2nd Deb. Stk. Red..	100	98 – 100
100,000	5	2/6	Buenos Ayres & Belgrano Electric Trams, Ltd., Ord.	5	3⅜ 3⅞
40,500	5	3/-	Do. "A" 6% Cum Pref. ..	5	5¾ 6
37,000	5	3/-	Do. "B" do.	5	5 5½
£300,000	Stk	5%	Buenos Ayres Elec. Trams Co. (1901) Ltd., 5% Db. Stk., Red.	100	96 98
£220,000	100	6%	Buenos Ayres Gd. Nat., Ltd., 6% 1st Deb. Bds.	100	100 -101

ELECTRIC TRACTION.—*Contd.*

Present Amount Subscribed.	Shares	Last Dividend.	Name	Paid up.	Closing Prices
102,268	5	5/-	Calcutta Tramways Co., Ltd. ..	5	9¾—10
£350,000	Stk	4%	Do. 4½% 1st Deb. Stk., Red.	100	104 106
480,000	1	6d.	Cape Electric Tramways, Ltd. ..	1	⅞ —1⅛
40,000	5	2/6	City of Birmingham Trams Co., Ltd. 5% Cum. Pref.	5	4⅞ 5⅛
£300,000	100	4%	Do. 4% 1st Mort. Debs. .	100	101—104
£120,000	Stk	5%	Colombo Elec. Tram. & Light. Co., Ltd., 5% 1st Mort. Deb. Stk. Red.	100	102—104
60,000	10	6/-	Dublin United Trams. Co. (1896), Ltd., Ord. ..	10	13¾—14¼
59,987	10	6/-	Do. 6% Pref...	10	14½— 15½
£125,000	Stk	4½	Hastings & Dist. Elec. Trams. Co., Ltd., 4% Deb Stock, Red. .	100	101 – 103
30,000	5	2/6	Isle of Thanet Elec. Trams. and Light. Co., Ltd., 5% Cum. Pref.	5	2¼— 2¾
£150,000	Stk	4%	Do. 4% Deb. Stock.. ..	100	82 — 87
125,000	10	5/-	London United Trams. (1901), Ltd., 5% Cum. Pref.	10	9⅝—10
£1,031,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	98 —101
60,007	1	1/-	London Motor Omnibus Co., Ltd., Ord. No. 1—60,007	1	1¾—2*
£50,000	Stk	5%	Madras Electric Trams (1904), Ltd., 5% Deb Stock, Red.	100	101 —103
314,016	1	—	Metropolitan Elec. Trams, Ltd., Def.	1	7/32— 9/32
500,000	1	6d.	Do. 5% Cum. Pref... ..	1	1 – 1 1/16
£350,000	Stk	4½%	Do. 4½% Deb. Stock, Red.	100	104 —106
50,000	5	6/-	New General Traction Co., Ltd., 6% Cum. Pref.	5	½— 1½
110,923	8	2/9⅗	North Metropolitan Tramways Co..	8	4 — 4½
£150,000	100	3½%	Do. 3½% Mort. Debs.	100	92 — 97
£196,200	Stk	5%	Perth Electric Trams, Ltd. (W.A.) 5% 1st Mort. Deb. Stock, Red..	100	104 —107
24,500	10	10/-	Potteries Elec. Traction Co., Ld., Or.	10	8¾– 9½
24,500	10	5/-	Do. 5% Cum. Pref. ..	10	9¾— 10¼
£220,000	Stk	4½%	Do. 4½% Deb. Stk., Red.	100	103 –106
£160,000	Stk	5%	Sunderland Dist. Elec. Trams. Ltd., 5% 1st Mort. Deb. Red... . ..	100	92 97
£275,000	Stk	4½%	Yorkshire (W. Riding) Elec. Trams Co., Ltd., 4½% 1st Deb. Stk., Red.	100	94 96

IV.—ELECTRIC LIGHTING AND POWER.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up	Closing Prices
7,500	10	14/-	Bournemouth & Poole Elec. Sup. Co., Ltd., Ord. ..	10	12⅜ – 12⅞
7,500	10	4/6	Do. 4½% Cum. Pref. ..	10	10¼ – 10¾
7,500	10	6/-	Do. 6% Cum. Second Pf. ..	10	11¾ – 12¼
£70,000	Stk	4½%	Do. 4½% Deb. Stock Red ..	100	105 107
14,000	5	3/6	Bromley (Kent) Elec. Lt. & Pr. Co. Ld	5	5¼ 5¾
£50,000	Stk	4½%	Do. do. 4½% 1st Deb. Stk. Red.	100	103 105
27,507	5	4/6	Brompton & Kensington Elec. Supply Co., Ltd. Ord. ..	5	8¾ – 9¼
12,493	5	8/3	Do. 7% Cum. Pref. Shares..	5	8¾ – 9½
60,000	5	3/3	Calcutta Elec. Sup. Cor. Ltd., Ord..	5	8¾ – 9¼
£238,782	Stk	4%	Central Elec. Sup. Co., Ltd., 4% Gua. Deb. Stk. ..	100	102 —105
70,000	5	2/6	Charing Cross & Strand Elec. Sup. Corp., Ltd., Ord... ..	5	6 6½
80,000	5	2/3	Do. do. 4½% Cum. Pref...	5	5½ 5¾
£350,000	Stk	4%	Do. do. 4% Deb. Stk. Red.	100	101 —103
41,436	5	2/3	Chelsea Elec. Sply. Co., Ltd., Ord.	5	5½ 6
£150,000	Stk	4½%	Do. do. 4½% Deb Stk., Red	100	108 110
70,595	10	7/-	City of London El. Lghtg. Co., Ld., O	10	11 12
40,000	10	6/-	Do. 6% Cum. Pref. .. .	10	13¾ 14¼
£400,000	Stk	5%	Do 5% Deb. Stk., Red ..	100	122 126
£300,000	Stk	4½%	Do. 4½% 2nd Deb. Stk., Red	100	101 103
40,000	10	4/-	County of London Elec. Supply Co., Ltd., Ord.	10	8¾ 9¼
30,000	10	6/-	Do. 6% Cum. Pref.	10	12¼ – 12¾
£400,000	Stk	4½%	Do. 4½% Deb. Stk., Red. ..	100	110 – 113
70,000	5	2/6	Edmundson's Elec. Cor. Ltd., Ord.	5	5 5½
70,000	5	3/-	Do. 6% Cum. Pref.	5	5¾ – 6
£300,000	Stk	4½%	Do. 4½% 1st Mort. Db. Stk. Reg	100	104 106
£80,000	Stk	5%	Electric Lighting & Traction Co. of Australia, Ltd. 5% Deb. Stk. Red.	100	85 – 90
10,000	5	2/-	Folkestone Elec. Supply Co., Ld., O.	5	5½ – 5¾
£50,000	Stk	4½%	Do. 4½% 1st Deb. Stk., Red.	100	101 104
15,000	10		Havana Electricity Co., Ltd...	10	8½— 9½
13,000	5	5/-	Hove Elec. Lighting Co., Ltd., Ord.	5	[illegible]
£50,000	Stk	4½%	Isle of Wight Electric Light & Power Co., Ltd. 4½% Deb. Stock, Red.	100	100 – 10[illegible]
150,000	1	—	Kalgoorlie Electric Power & Lighting Corp, Ltd., 6% Cum. Pref.	1	½ – 1
21,000	5	5/-	Kensington and Knightsbridge Electric Lighting Co., Ltd., Ord. ..	5	10¾ – 11¼

Stocks and Shares marked * are quoted ex-dividend

ELECTRIC LIGHTING AND POWER.—*Contd.*

Present Amount Subscribed	Shares.	Last Dividend	Name.	Paid up.	Closing Prices
£135,000	Stk	4%	Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., 4% Deb. Stock, Red.	100	101 –103
111,000	9	1 9¼	London Elec. Supply Corp., Ld., Ord.	8	1¾ –2½
60,000	5	8/-	Do. 6% Pref.	5	4¾ – 5¼
£871,895	Stk	4%	Do. 4% 1st Mort. Db. Stk., Red.	100	98 –101
100,000	10	5/-	Metropolitan Elec. Sup. Co., Ld., Or.	10	9 –10
76,121	5	2/3	Do. 4½% Cum. Pref.	5	5¼ – 5¾
220,000	Stk	4½%	Do. 4½% 1st Mort. Db. Sk., Red.	100	107 –111
250,000	Stk	3½%	Do. 3½% Mort. Deb. Stk, Red.	100	95 – 97
£260,000	—	4½%	Midland Elec. Corp. for Power Distribution, Ld., 4½% 1st Mort. Deb.	100	99 –101%
10,852	10	8/-	Notting Hill Elec. Ltg. Co. Ltd. Ord.	10	13¾ – 14¾
£59,000	100	4%	Do. 4% 1st Mort. Debs. ..	100	98 –100
16,500	5	2/6	Oxford Electric Co. Ltd., Ord. ..	5	6½ – 6⅞
£50,000	Stk	4%	Do. 4% Debenture Stk. Red.	100	98 –101*
£84,700	100	4½%	Royal Elec. Co. (of Montreal) 4½% 20-yr. 1st Mort. Deb	100	100 –103
40,000	5	5/-	St. James' & Pall Mall Elec. Light Co., Ltd. Ord.	5	12 –13
20,000	5	3/6	Do. 7% Pref...	5	7 – 8
£150,000	Stk	3½%	Do. 3½% Deben. Stock, Red	100	97 – 99
12,000	5	4/-	Smithfield Markets Elec. Supply Co., Ltd. Ord.	5	2 – 2¼
£50,000	Stk	4%	Do. 4% Debenture Stk Red.	100	76 – 80
65,000	5	4/-	South London Elec. Sup. Co., Ltd. O.	5	8 – 9½
100,000	1	—	South Metropolitan Elec Light & Power Co., Ltd. Ord.	1	¾ – ⅞
50,000	1	8⅖d.	Do. 7% Cum. Pref.	1	1¹⁄₁₆ –1⁷⁄₁₆
£100,000	Stk	4½%	Do. 4½% 1st Deb. Stock Red.	100	105 –108
50,000	5	2/6	Urban Electric Supply Co., Ltd., O.	5	4⅝ – 4⅞
30,000	5	2/6	Do. 5% Cum Pref.	5*	5 – 5¼
£200,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Red	100	105 –107
110,000	5	6/6	Westminster Elec. Supply Corp. Ltd., Ord.	5	11¼ –12¼
28,151	5	2/6	Do. 5% Cum. Pref.	5	—

V.—TELEGRAPH & TELEPHONE COMPANIES.

Present Amount Subscribed	Shares.	Last Dividend	Name	Paid up.	Closing Prices.
£84,800	100	4%	African Direct Tel. Co., Ld., 4% Mt. Debs. (Series A), Red.	100	98½–100½*
25,000	10	—	Amazon Telegraph Co., Ld... ..	10	3¾ – 4¼
£763,580	Stk	14/-	Anglo-American Tel. Co., Ltd., Ord.	100	63 – 65
£3,118,210	Stk	28/-	Do. 6% Preferred Ordinary	100	111 –112
£3,118,210	Stk	2/-	Do. Deferred Ordinary ..	100	16⅛ – 16⅞
44,000	5	3/-	Chili Telephone Co., Ltd.	5	7¾ –8⅛*
$15,000,000	$100	$2	Commercial Cable Co., Capital Stk.	$100	———
£1,903,856	Stk	4%	Do. Sterl. 500-yr 4% Deb. Stk., Red.	100	98 –100
16,000	10	5/-	Cuba Submarine Tel. Co., Ld., Ord.	10	8½ – 9
6,000	10	10/-	Do. 10% Preference	10	17 –18
6,000	5	2/-	Direct Spanish Telegraph Co., Ord.	5	3⅜ – 3⅞
		5/-	10% Cum. Preference	5	8¼ – 8¾
£30,000	50	4½%	Do. 4½% Debs...	50	99-102%
60,710	20	4/-	Direct U.S. Cable Co., Ltd... ..	20	14½–15½
£85,800	100	4½%	Direct West India Cable Co., Ltd., 4½% Reg. Debs.	100	91 –101
£300,000	100	4%	East. & S. African, Ld., 4% Mt. Dbs.	100	101 –103
£200,000	25	4%	Do. 4% Rg. Mt. Dbs. (Mauritius Subsidy)..	25	101 –103%
300,000	10	2/6	Eastern Extension, Australasia and China, Ltd...	10	14½–15*
£602,400	Stk	4%	Do. 4% Mort. Deb. Stk., Perp.	100	107 –109
£4,000,000	Stk	25/-	Eastern Tele. Co., Ltd., Ord. ..	100	146 –149*
£2,000,000	Stk	17/6	Do. 3 % Pref.	100	91½–93½*
£1,836,814	Stk	4%	Do. 4% Mort. Deb.	100	107 –109
150,000	10	5/-	Great Northern Telegraph Co., Ltd., (of Copenhagen) ..	10	37½–39½*
£58,700	100	4½%	Halifax and Bermudas Cable Co., Ltd., 4½% 1st. Mort. Debs. Red.	100	99–101
17,000	25	12/6	Indo-European Tele. Co., Ltd. ..	25	57 –59
£251,127	1		Marconi's Wireless Tel. Co, Ltd. ..	1	1⅛ –1½
72,080	1	9½d.	Monte Video Telephone Co., Ltd., O.	1	⅞ – 1
£1,988,333	Stk	6%	National Telephone Co., Ltd., Pref.	100	113 –114
£1,966,667	Stk	5%	Do. Deferred	100	111 –112
250,000	5	2/6	Do. 5% Non-Cum. 3rd Pref.	5	5⅜ – 5⅝
£2,000,000	Stk	3½%	Do. 3½% Deb. Stk., Red. ..	100	99 –101
£689,593	Stk	4%	Do. 4% do. do. ..	100	104 –106
179,313	1	7½d.	Oriental Telephone & Elec. Co., Ltd.	1	1⁵⁄₁₆ – 1⁷⁄₁₆
50,000	1	7½d.	Do. 6% Cum. Pref.	1	1¼ – 1⅜
£100,000	100	4%	Pacific & European Tel. 4% Guar. Debs. Red...	100	99 –102
11,839	8	4/-	Reuter's Telegram Co., Ltd. ..	8	7¼ – 7¾
58,000	5	3/-	United River Plate Telep. Co., Ltd.	5	7¼ – 7½
40,000	5	2/6	Do. 5% Cum. Pref.	5	5½ – 5¾
£179,947	Stk	5%	Do. 5% Deb. Stock, Red. ..	100	110 –112
15,609	10	4/-	W. African Telegraph Co., Ltd. ..	10	9½–10
£30,008	2½	-	West Coast of America, Ltd. ..	2½	⁹⁄₁₆ ¹¹⁄₁₆
150,000	100	4%	Do. 4% Deb. Guar. by West. Tel.	100	99½–101½

TELEGRAPHS AND TELEPHONES.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend	Name	Paid up.	Closing Prices.
88,321	10	6d.	W. India & Panama Teleg. Co., Ld., Or.	10	½ – ¾
34,563	10	6/-	Do. 6% Cum. 1st. Pref. ..	10	8¼ – 8¾
4,669	10	6/-	Do. 6% Cum. 2nd Pref. ..	10	6½ 7½
£80,000	100	5%	Do. 5% Deb.	100	103 –105
207,930	10	8/-	Western Telegraph Co., Ltd. ..	10	14¼ –14¾
£75,000	100	5%	Do. 5% Debs., 2nd Series, 1906	100	100 –102
518,945	Stk	4%	Do. 4% Deb. Stock, Red. ..	100	102 –104

VI.—SHIPPING COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name	Paid up.	Closing Prices
32,500	10	5/6	Anchor Line (Henderson Bros.), Ltd., 5½% Cum. Pref.	10	9¼ – 9¾
£325,000	Stk	4½%	Do. 4½% Red. 1st Mort. Deb. Stk.	100	100–102
£672,900	Stk	4½%	British & African Stm. Nav. (1900) Ltd., 4½% 1st Mort. Deb. Stk. Red.	100	97 – 99
40,000	10	5/6	Bucknall Steamship Lines, Ltd., 5½% Cum. Pref.	10	6½ – 6¾
£600,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk.	100	—
£750,000	Stk	4½%	Clan Line Steamers, Ltd., 4½% Deb. Stk. Red. ..	100	97 – 99
60,000	20	16/-	Cunard Steam Ship Co., Ltd., Nos. 1-60,000..	20	14¼ – 14¾
40,000	20	8/-	Do. Nos. 60,001-100,000	10	6½ – 7
£464,430	Stk	4½%	Elder Dempster Shipping, Ltd., 4½% 1st Mort. Deb. Stk. ..	100	102–104
1,200,000	1	6d.	Furness, Withy & Co., Ltd., Ord...	1	1⅝ – 1¾
25,328	7½	4/7	Gen. Steam Navigation Co., Ld., Ord.	7½	5¾ – 6¼
36,758	8	4/9⅗	Do. Non-Cum. 6% Pref.	8	9 – 9½
£150,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	97 – 99
55,000	5	1/3	Houlder Line, Ltd., Ord.	5	1 – 2
40,000	5	2/9	Do. 5½% Cum. Pref.	5	2¼ – 3¼
£200,000	Stk	4½%	Do. 4½% 1st Mt. Deb. Stk. Red.	100	83 – 86
141,500	10	5/-	Leyland (Fredk.), & Co., (1900), Ltd., 5% Cum. Pref. ..	10	5½ – 6
20,349	10	5/-	Orient Stm. Nav. Co., Ltd., Pref. Nos. 1-20,349 ..	10	7 – 7½
£103,100	Stk	4%	Do. 4% Deb. Stk., Red. ..	100	87 – 90
£1,160,000	Stk	5 %	Peninsular and Oriental Steam Nav. Co., 5% Cum. Pref. ..	100	127 –130
£1,160,000	Stk	19%	Do. do. Deferred ..	100	239 –242
15,000	100	30/-	Royal Mail Steam Packet Co. Ord..	60	53 – 54
39,075	5	2/6	Shaw, Savill & Albion, Ltd., 5% Cum. "A" Pref..	5	4¾ – 5¼
39,075	5	2/6	Do. "B" Ord...	5	3¾ – 4¼
141,841	10	4/-	Union Castle Mail Steamship Co., Ltd., Ord..	10	8¼ – 8¾
24,000	10	4/6	Do. 4½% Cum. Pref... ..	10	10½ – 11
£1,008,894	Stk	4%	Do. 4% Debenture Stk., Red.	100	99 –101

VII.—MISCELLANEOUS COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name	Paid up	Closing Prices
60,000	1	9⅗d.	Chadburn's (Ship) Tele. Ltd., Ord...	1	1 –1¼
£750,000	Stk	5%	General Hydraulic Power Co., Ltd.	100	121 –126
12,500	10	10/-	Oakey (John) and Sons, Ltd., Ord..	10	26 – 28
10,000	10	6/-	Do. do. 6% Cum. Pf.	10	14 – 15
183,538	1	6·3d.	Power Gas Corp., Ltd., Ord., Nos. 66,463-250	15/-	¼ – ½
66,462	1	8·4d.	Do. do. Nos. 1 66,462	1	⅜ – ½
135,000	1	6d.	Waygood (R.) & Co., Ltd., Ord. ..	1	1¹⁄₁₆ –1³⁄₁₆
135,000	1	7⅛d.	Do. 6% Cum. Pref. ..	1	1⅜ –1½*

RAILWAY CARRIAGE & WAGON COMPANIES.

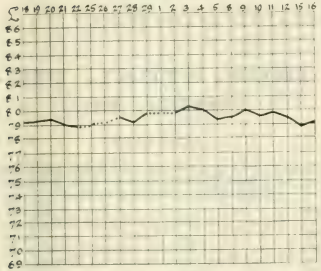
Present Amount Subscribed.	Shares.	Last Dividend	Name	Paid up.	Closing Prices
10,000	10	7/6	Birm. Railway-Car. & Wagon, L., 1-10,000	10	26 – 26½
8,739	10	3/-	Do. Second Issue 1-8,739....	4	9¾ –10
10,000	10	6/-	Do. Cum. Pref. 6% 1-10,000 .	10	13¾ –14¼
30,111	7	7/-	Gloucester Rail.-Car & Wagon, Ld., A, 1-29,861 & 49,751-50,000	7	10⅜ – 10⅞
44,889	7	3/6	Do. B, 29,862-49,750, 50,001-75,000	7	4⁵⁄₁₆ – 4⁷⁄₁₆
14,567	10	1/8	Lancashire Wagon, Ord.	2	2¼ – 2¾
4,150	10	5%	Do. do.	10	10⅜ – 10⅞
784,808	1	9d.	Metropolitan Amalgamated Rail.-Carriage & Wagon, Ld., 1-784,808	1	44 6 –45/6
164,288	1	6d.	Do. Cum. A Pref. 5% 1-164,288	1	24/. –25/.
235,000	1	7½d.	Do. Cum. B Pref. 6% 1-235,000	1	28/3 –29/3
20,000	20	20/-	Midland Rail.-Car & Wagon, Ld., 1-20,000	10	20¾ – 21¼

Stocks and Shares marked * are quoted ex-dividend.

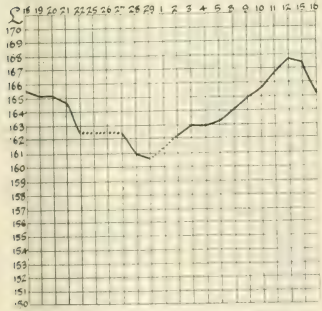
THE HOME METAL MARKET.

SHOWING DAILY FLUCTUATIONS FROM DECEMBER 18TH, 1905, TO JANUARY 16TH 1906.

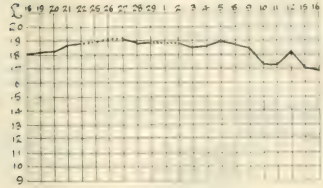
COPPER.



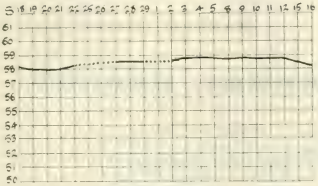
TIN.



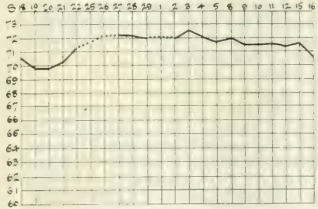
ENGLISH LEAD.



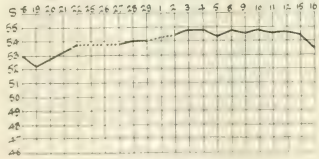
PIG IRON: SCOTCH.



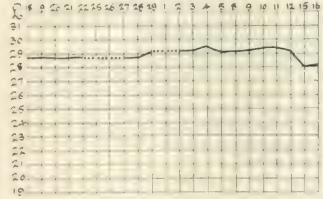
HEMATITE.



CLEVELAND.



SPELTER.



PRICES CURRENT OF COAL, IRON, STEEL, AND OTHER METALS.

MANUFACTURERS' AND MERCHANTS' QUOTATIONS.

MARKET REPORT.

Wednesday, January 17th, 1906.

COPPER still remains an active market, but there is a tendency towards irregularity, and the feature has been the "back" on forward metal, which has risen to over £2 per ton. It would appear, however, that the bear attack is a very hazardous speculation, in view of the small stocks of standard copper and the strong control exercised. In some quarters, as Merton and Co.'s last circular pointed out, it is the fashion to look to re-shipments of copper from China, but the quantities which are likely to be returned from that country are not nearly as large as is currently reported, and moreover are stated to be almost exhausted. Outside this source there is barely anything that could be warehoused as standard copper in due time, the requirements of the trade being such as to absorb anything that is available. Some statistics dealing with the position in the United States will be of interest. The production last year increased by about 50,000 tons, giving an output of about 413,000 tons as against about 363,000 tons during 1904, while the consumption was about 295,000 tons, or an increase over last year of about 76,000 tons.

In the Tin market a sudden change has been witnessed. Up to two days ago the tendency was strong. The continued good demand from consumers and especially the heavy purchases by America had forced dealers to replenish their holdings in the open market, as the East was not inclined to sell. Then came the realisation of some speculative positions, and after the metal had seen the price of £168 cash there was a sharp fall to £164 5s. cash, £164 10s. three months.

Quite an active business has been done during the week on the London lead market, but it was comprised mostly of re-sales of lots purchased on speculation, and as prompt metal is still in plentiful supply and consumers are very reserved, lower values had to be accepted. Prices have relapsed to £16 10s. Spelter has been an uneventful market.

The speculative iron markets in London and Glasgow have been somewhat less active and prices are lower, Cleveland being quoted at 54/1½ and Hematite at 71/- cash. Unabated strength characterises the situation in the iron and steel industries.

IRON, STEEL, PIG-IRON, &c.

SCOTLAND.

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B., quote as follows. Prices delivered in Glasgow or equal :—

Steel :		£	s.	d.
DALZELL STEEL	Siemens' Steel Plates, Marine Boiler Quality ..	8	2	6
☎☎ STEEL	,, ,, ,, Land ,, ,, ...	8	2	6
STEEL	,, Steel Bars, Boiler Quality	8	5	0
DALZELL	Siemens' Steel Plates, Ship Quality Plates.....	7	2	6
☎ STEEL	,, ,, Bars ,, ,, ...	7	15	0
	,, Angles.....	6	15	0

Manufactured Iron :

		£	s.	d.
Bars—Dalzell		7	2	6
,,	Best	7	12	6
,,	,, Horseshoe	7	12	6
,,	Angle	7	2	6
,,	Best Angle	7	12	6
,,	Best Best	8	2	6
,,	Extra Best	8	12	6

Usual terms and extras. Special rates for delivery in England and export. The above prices subject to alteration without notice.

Malleable Common Bars :	£	s.	d.	5 per cent.
Dalzell, per ton	7	2	6	
Govan	6	10	0	,,
North British	6	10	0	,,
Drumpellier	6	7	6	,,
Waverley	6	10	0	,,
Crown	6	5	0	,,
Dundyvan	6	5	0	,,
Muirkirk	6	5	0	,,
Rochsoloch	6	5	0	,,
Phœnix	7	5	0	,,
Coatbridge	7	2	6	,,
Coats	6	5	0	,,
Angle Iron				,,
Steel Plates, ship				,,
,, Boiler Plates				,,
Rails.....				,,
Railway Chairs				,,

G.M.B. at Glasgow, No. 1, 64s. ; No. 3, 61s.

John Spencer (Coatbridge), Ltd., Phœnix Iron-works, Coatbridge, N.B., quote :—

		£	s.	d.
Bars—Phœnix		7	5	0
,,	Best	7	15	0
,,	Best Best	8	5	0
,,	Extra Best.....	8	15	0
,,	Best Horse Shoe	7	15	0
,,	Extra B.H.S.	8	15	0
,,	Extra Best Cable	9	5	0
,,	Rivet	7	5	0
,,	Best Scrap Rivet	8	5	0

	£ s. d.
Angles—Phœnix	7 5 0
,, Best	7 15 0
,, Extra Best	8 5 0
Gas Tube Hoops—Phœnix Best	7 15 0
Plates—Phœnix	
,, Best Boiler	8 10 0
,, Best Best Boiler	9 0 0
,, Extra Best Boiler	10 0 0
Boiler Tube Strips—Phœnix	9 0 0

All per ton, delivered f.a.s., Glasgow, Greenock, Grangemouth, Granton, Leith, or Ardrossan. 5 per cent. discount cash monthly.

Messrs. R. Feldtmann and Co., of Glasgow, quote (Commission extra).

Pig Iron:	No 1. £ s. d.	No 3. £ s. d.
Coltness, f.a.s. Glasgow	3 16 0	3 6 0
Gartsherrie	3 8 6	3 3 6
Summerlee	3 11 0	3 6 0
Carnbroe	3 5 6	3 2 6
Langloan	3 10 0	3 5 0
Calder	3 7 6	3 2 6
Clyde	3 8 0	3 3 0
Glengarnock, f.o.b. Ardrossan	3 8 0	3 3 0
Eglinton	3 3 6	3 1 0
Dalmellington, ,, Ayr	3 6 0	3 1 0
Shotts ,, Leith	3 7 6	3 2 6

NORTH OF ENGLAND.

Messrs. W. Whitwell and Co., Ltd., Thornaby Ironworks, Stockton, quote as follows, **at works:—**

	£ s. d.
W.W. Bars	7 10 0
W.W. Best Bars	7 17 6
W.W. Best Best	8 5 0
W.W. Best Best Best	8 12 6
W.W. Best Shoe	8 0 0
Thornaby	9 0 0
Thornaby Best	9 10 0
Thornaby Best Best	10 10 0
Whitwell Special Admiralty Cable	11 0 0
Special Chain Iron	10 0 0
Tube and Nail Strip iron ..... net cash	7 10 0
W.W. Angle Iron	7 12 6
W.W. Best Angle Iron	8 0 0
Tee Iron, to 8-inches United	8 10 0

Terms, Cash, less 2½ per cent. discount on 10th of month following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd., Dallam and Bewsey Forges, Warrington, quote as follows:—

	Iron. £ s. d.	Steel. £ s. d.
Bars	7 15 0	8 0 0
Angles	8 5 0	8 10 0
Tees	8 15 0	9 0 0
Hoops	8 0 0	8 0 0
Sheets	9 0 0	9 5 0

Ordinary Sizes, F.A.S. Liverpool in 10-ton Lots.

Extras for Sizes and Cutting as per List.

Lots under 10 tons of one size 10s. per ton extra.

WORCESTERSHIRE.

Baldwins Ltd. (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote:—

	Singles 20 G to 8in. by 36in. per ton. £ s. d.	Doubles 21 G to 24 G 8in. by 36in. per ton. £ s. d.
Black Sheets		
"Vale	11 0 0	12 0 0
"Shield"	11 10 0	12 10 0
"Severn"	12 10 0	13 10 0
"Baldwin Widder B	13 10 0	14 10 0
Charcoal	17 10 0	18 10 0
Best Charcoal	19 10 0	20 10 0

Pickled, cold-rolled and close annealed sheets specially quoted for.

Extra widths, Singles to 66in., Doubles to 56in., Lattens to 46in. Extra lengths, Singles to 168in., Doubles to 132in., Lattens to 108in.

Patent Coated Sheets:	£ s. d.	£ s. d.
No. 3 Lead	14 10 0	15 10 0
S.V. Lead	16 0 0	17 0 0
No. 3 Terne	16 0 0	17 0 0
S.V. Terne	17 10 0	18 10 0

	Singles 20 G to 10in. by 36in. per ton £ s. d.	Doubles 21 to 24 G to 9in. by 36in. per ton. £ s. d.
Tinned Sheets:		
Best Coke (Finish)	30 0 0	31 10 0
,, Charcoal (Finish)	32 0 0	33 10 0
Extra ,, ,,	34 0 0	35 10 0

Cotton Can Tin Sheets to 39in. by 36in. specially quoted for.

Tin Plates, "Cookley, K" Best Charcoal, £1 7s. 0d. per box.

Extreme sizes in Tin and Patent Coated specially quoted for.

Lattens up to 36 wide by 27 W.G. £1 10s. 0d. per ton extra throughout for all brands.

At works.

Galvanized Corrugated Sheets:

	£ s. d.	
"Phœnix" Brand, 24 G., f.o.b. London, in Bundles	13 7 6	per ton.
"Blackwall" Brand, 26 G., in felt-lined cases for Australia, f.o.b. London	16 5 0	,,

Galvanized Working Up-Sheets:

	£ s. d.	
24 G., f.o.b. London, in Bundles	14 7 6	per ton.

STAFFORDSHIRE.

Shelton Iron, Steel, and Coal Co., Ltd., Stoke-on-Trent, North Staffordshire, and 122, Cannon Street, London, quote:—

	£ s. d.	
Crown Bars	7 10 0	per ton.
Best Bars (1 to 6in. wide, above ¼ in. thick & ½ to 1 in. rounds and squares)	8 0 0	,,
Angles	7 15 0	,,
,, Best	8 0 0	,,
Tees	8 0 0	,,
,, Best	8 10 0	,,
Best Shoe Iron	8 0 0	,,
Lower Iron	9 0 0	,,
Best Best (Special)	10 5 0	,,
Gates	10 5 0	,,
,, Screwing	9 5 0	,,

	£	s.	d.	
Best Turning	8	0	0	per ton.
,, Plating	9	5	0	,,
Best Best	10	5	0	,,
Treble Best	11	5	0	,,
Plates	8	10	0	,,
Best Plates	9	0	0	,,
,, Boiler Plates	9	10	0	,,
,, Best Boiler Plates	10	10	0	,,
Treble Best Boiler Plates	13	0	0	,,

Delivery f.o.b. Liverpool, Birkenhead or Manchester.

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon., quote "Star" brand patent wrought nails steel nails, &c.

Discounts—

42½ per cent. off 1-inch to 3-inch strong rose and all fine rose and 6dy. and 8dy. pound.

37½ per cent. off 3½-inch to 7-inch strong rose and 10dy. and 20dy. pound.

37½ per cent. off all sharp-pointed nails.

Delivered in lots of 4 cwt. and upwards. Extra 2½ per cent. discount off the gross on two tons and upwards.

Steel rose, flat points, 5-inch to 7-inch basis:—
2 tons 10/6 per cwt. } d/d any Railway Station.
4 cwt. lots and upwards 10/9 per cwt. }

Steel cut nails, 3-inch to 6-inch basis—
2 tons 9/3 per cwt. } d/d any Railway Station.
4 cwt. lots 9/6 per cwt. }

Slit rods (iron) £8 per ton, at works for 2-ton lots.

Messrs. Richard Thomas and Co., Ltd., of 33 and 35, Eastcheap, E.C. — Works: South Wales, Burry, Lydney, Lydbrook, and Cwmbwrla, quote:—

Coke Tin-plates.

	Per Box. f.o.b. Wales. £	s.	d.
C 18¾ by 14 124s. 110 lb. "BV"	0	13	6
C 20 by 10 225s. 155 ,, "Jumbo"	0	18	9
C 20 by 14 112s. 108 ,, "Lydbrook"	0	13	3
C 28 by 20 112s. 216 ,, "Lydbrook"	1	6	9

Charcoal Tinplates:

C 20 by 14 112s. 108 lb. "Alhaway"	0	14	0

BELGIUM.

C. L. Faulkner, Suffolk House, Laurence Pountney Hill, London, E.C., quotes:—

Prices quoted are in £ stg. and per ton of 1,015 kos. (2,240 lb.) delivered free on board ANTWERP for approved quantities.

Steel:

	£	s.	d.	
Blooms	at 4	6	0	per ton.
Billets	at 4	8	0	,,
Sheet Bars	at 4	10	0	,,

Finished Steel:

Bars	at 6	0	0	per ton.
Angles	at 6	2	0	,,
Tees	at 6	4	0	,,
Joists	at 5	5	0	,,
Fencing Standards	at 6	7	6	,,
Shoeing Bars	at 6	5	0	,,
Tyre Bars	at 6	5	0	,,
Half Round Bars	at 6	10	0	,,
Heavy Rails	at 6	0	0	,,
Light Rails	at 6	0	0	,,

Structural Steelwork:

Prices on application.

METALS.

Messrs. French and Smith, 147, Leadenhall Street, and 11, Oldhall Street, Liverpool, quote:—

TIN.

Tin:	£	s.	d.	£	s.	d.	
English Ingots, f.o.b.							
Dis. 1¼% & 1%	167	10	0	to 168	0	0	per ton
English Bars, f.o.b.							
Dis. 1¼% & 1%	168	10	0	to 169	0	0	,,
Straits G.M.B., cash Warehouse, Net	166	0	0	to 166	2	6	,,
Straits G.M.B., 3 months, Warehouse, Net	166	2	6	to 166	5	0	,,
Australian, Mt. Bischoff, Warehouse, Net	167	0	0	to 167	5	0	,,

COPPER.

Copper:	£	s.	d.	£	s.	d.	
Standard G.M.B., cash Warehouse, Net	78	15	0	to 79	0	0	per ton.
Standard G.M.B., 3 months, Warehouse, Net	76	17	6	to 77	0	0	,,
English, Tough, Cake & Ingot, Warehouses, Net	86	0	0	to 86	10	0	,,
English, Best Select, Warehouse Net	86	0	0	to 86	10	0	,,
English, Sheets and Sheathing, f.o.b., Dis. 2½%	95	0	0	to 95	10	0	,,
English, Sheets for India, f.o.b., Dis. 2½%	90	0	0	to 91	0	0	,,
Electro, Warehouse, Net	88	10	0	to 89	0	0	,,
Ore, ex. ship	0	15	6	to 0	16	6	per unit.
Regulus, Matte and Precipitate, ex ship,	0	16	6	to 0	17	0	,,

YELLOW METAL.

Yellow Metal:	£	s.	d.	
Sheets, 4 by 4 feet for India f.o.b. Dis. 2½%	0	0	7¾	per lb.
Sheathing ,, ,,	0	0	8	,,

SPELTER.

	£	s.	d.		£	s.	d.	
Silesian outports, Net	28	2	6	to	28	5	0	per ton.
Blende of 50% Net	8	10	0	to	8	13	6	,,
Calamine, Net	8	12	6	to	8	15	0	,,

LEAD.

	£	s.	d.		£	s.	d.	
English Pig, Warehouse, Dis. 2½%	16	15	0	to	16	17	6	per ton
Spanish, ex ship, Dis. 2½%	16	12	6	to	16	15	0	,,
Lead Ore of 70%, Net	9	0	0	to	9	10	0	,,

ANTIMONY.

	£	s.	d.		£	s.	d.	
Star Regulus, f.o.b., Dis. 2½%	64	0	0	to	65	0	0	per ton.
Ore, 50%, ex ship, Dis. 2½%	16	0	0	to	17	0	0	,,
Crude, ex ship, Dis. 2½%	32	0	0	to	35	0	0	,,

QUICKSILVER.

	£	s.	d.	
Spanish, 75 lb., Warehouse, Net	7	5	0	per flask
Italian ,, ,,	7	2	6	,,

COAL.

LEICESTERSHIRE.

The Nailstone Colliery Company, Leicester, quote. Price per Ton at Pit of 20 Cwt., with ½ Cwt. per Ton for wastage —

Upper Main Seam.	s.	d.
Main Coal	6	6
Best Hard Steam (hand picked, as used by the Railway Companies)	5	6
Best Hard Steam Cobbles (made through 6 in. mesh, free from slack)	6	0
Fine Slack	0	6

Terms, net cash on 10th of month following delivery.

DERBYSHIRE.

The Manners Colliery Co., Ltd., of Ilkeston, quote as follows, per ton at pit :

Kilburn Coal :	s.	d.
Best London Brights	9	3
Large Nuts (1¼ to 3½)	9	0
Small Nuts (¾ to 1¼)	6	0
Peas (¾ to ¾)	5	0
Rough Slack	4	0
Slack	3	6
Smudge	2	0

Rutland Coal :		
Brights (4 to 8)	7	6
Large Nuts (2 to 4)	7	0
Slack	3	6
Hand-picked Hards	7	6
Hard Cobbles	6	3

The Clay Cross Company's Collieries, Clay Cross, near Chesterfield, quote:—

	per ton at pit. s.	d.
Best Main Coal	10	6
Best Silkstone	10	0
Best House Coal	9	6
Best House Nuts	8	0
Treble Screened Cobbles	7	9
Best Cobbles	7	3

NOTTINGHAMSHIRE.

The Digby Colliery Co., Ltd., near Nottingham, quote per ton at pit :—

Digby Coal :		
STEAM.	s.	d.
Best Hand Picked Hard	8	6
Steam Hard	7	3
Hard Nuts	6	6

Gedling Colliery.		
HIGH HAZEL (or Ashless House) Coal.		
London Brights, 4 to 8 in. cube	11	0
Bright Cobbles (Hand Picked)	10	6
Large Nuts, 2 to 4 in. cube	10	0
Small Nuts, 1 to 2 in. cube	8	3
Pea Nuts, ¾ to 1 in. cube	5	6
STEAM.—TOP HARD.		
Best Hard	8	6
Hard Steam	7	6
Cobbles	6	3

CHEMICALS.

Messrs. S. W. Royse and Co., Albert Square, Manchester, quote :

	£	s.	d.	
Acids : Oxalic	0	0	2½	per lb
Picric, Crystals	0	0	11	..
Tartaric at Manchester	0	0	11	..

	£	s.	d.	
Acetate of Lime : Brown at Manchester net	8	10	0	per ton.
Grey	11	15	0	..
Alumina : Alum, Lump, loose	5	7	6	..
,, ,, in casks	5	10	0	..
,, Ground, in bags	5	17	6	..
Sulphate of Alumina, 14%	4	10	0	..

Ammonia : Carbonate	0	0	3⅝	per lb.
Muriate Grey f.o.b. Liverpool	24	15	0	per ton
Sal-ammoniac, Lump, 1sts, del^d U.K.	42	0	0	,,
,, ,, 2nds, ,,	40	0	0	..
Sulphate f.o.b. Liverpool	12	18	0	..
Arsenic : Best White Powdered net	16	10	0	..
Bleaching Powder, 35%	4	10	0	..
Borax : British Refined Crystal	13	0	0	..

Coal Tar Products :				
Benzole, 50 90%	0	0	8½	per gal
90%	0	0	9	..
Carbolic Acid Crystals, 34 35° C.	0	0	6	per lb
,, ,, ,, 39/40 C.	0	0	6½	..
,, ,, Liquid, 97 99%	0	0	9	per gal.
,, ,, Crude, 60/2% at 60° F. f.o.b. ,,	0	1	10	..
Creosote, ordinary good liquid ,,	0	0	1½	,,
Naphtha, Crude, 20 % at 120° C. ,,	0	0	4	..
,, Solvent 90% at 160° C. f.o.b. ,,	0	1	0	..
,, ,, 95 % at 160° C. ,,	0	1	0½	..
,, ,, 90 % at 190° C. ,, ,,	0	1	1½	,,
,, Rectified, flash point over 73° F. f.o.b. ,,	0	1	1½	..
,, Rectified, flash point over 100° F. f.o.b. ,,	0	1	2½	..
Naphthalene, all qualities				
Pitch f.a.s. Manchester. ,,	1	11	6	per ton.
Copperas : Green, in bulk ,,	0	12	6	,,
,, barrels f.o.b. L'pool ,,	1	18	6	..
Cake	1	1	6	..
Copper : Sulphate	25	5	0	..

Cyanides : 98% minimum f.o.b. net	0	0	8¼	per lb.

Lead : Acetate (Sugar) White, English	28	0	0	per ton.
,, ,, ,, Foreign c.i.f U.K	25	10	0	..
,, ,, Grey	23	10	0	..
,, ,, Brown at Manchester	19	15	0	..
Nitrate	27	0	0	..
Litharge, Flake	19	5	0	..
,, Powder	19	15	0	..
Red Lead, Genuine, c.i.f London less 5%	19	5	0	..
White Dry	20	0	0	..

Naphtha (Wood) : Miscible, 60 o.p.	0	2	4	per gal.
Solvent	0	2	7	..

Potash : Bichromate, delivered England	0	0	3	per lb.
Carbonate, 90/92 % c.i.f Hull	16	15	0	per ton.
Caustic, 75/80	18	12	6	..
Chlorate net	0	0	3½	per lb
Montreal in Store, Liverpool	31	10	0	per ton.
Prussiate Yellow net	0	0	4½	per lb.

		£	s.	d.		
Soda:	Ash, Caustic, 48 %, Ordinary .. net	5	5	0	per ton.	
	,, ,, ,, Refined ..,,	6	5	0	,,	
	,, Carbonated, 48 %,,	5	10	0	,,	
	,, ,, 58 %, (Ammonia Alkali) net	4	10	0	,,	
	,, Bleachers' Refined Caustic 50/52 % net	6	10	0	,,	
	Caustic, White, 77 %,,	10	12	6	,,	
	,, ,, 70 %,,	9	12	6	,,	
	,, ,, 60 %,,	8	12	6	,,	
	,, Cream, 60 %,,	8	10	0	,,	
	Crystals, in bags	3	0	0	,,	
	,, barrels	3	7	6	,,	
	Acetate c.i.f. Hull net	16	15	0	,,	
	Bicarbonate, in 1 cwt. kegs	6	15	0	,,	
	Biehromate delivered England	0	0	2½	per lb.	
	Chlorate net	0	0	3½	per lb	
	Nitrate...ex quay Liverpool, ... ,,	11	0	0	per ton.	
	Phosphate net	9	5	0	,,	
	Prussiate net	0	0	3 7/16	per lb.	
	Silicate, Solution, 140° Tw.	4	10	0	per ton.	
	Sulphate (Glauber Salts)	1	10	0	,,	
	,, (Saltcake, 95%)	1	15	0	,,	
Sulphur:	Recovered	4	15	0	,,	
	Roll	6	15	0	,,	
	Flowers	7	10	0	,,	
Zinc:	Sulphate	6	15	0	,,	
Shellac:	Standard TN orange spot	9	10	0	per cwt.	

MINERALS.

Messrs. S. W. Royse and Co., quote:—

		£	s.	d.	
Barytes:	Lump Carbonate, 90/92%	3	10	0	per ton.
	Sulphate, No. 1 White	2	15	0	,,
China Clay:	of various qualities for all purposes; prices from about 11/- to about 30/- per ton, f.o.b. Cornwall: stocks also kept at Runcorn and Preston. Quotations given carriage paid.				
Chrome Ore:	Basis 50% c.i.f. British Ports	3	10	0	,,
Manganese:	Lump c.i.f. Liverpool 10½d.	per metallic unit.			
Ochre:	French JC f.o.b. Rouen, net	2	5	0	per ton.
	,, JF	5	10	0	,,
Talc:	(French Chalk) c.i.f. Liverpool	3	10	0	,,

Messrs. Henry Bath and Son, quote:—

	£ s. d.	£ s. d.	
Copper, Ores of, 10 to 25%	0 15 6 to	0 16 6	per unit.
Regulus, 45 to 55%	0 16 6 to	0 17 6	,,
Precipitate, 65 to 80%	0 16 7½ to	0 17 1½	,,
Tin Ores, 70 %	103 0 0 to 105 0 0		per ton
Lead Ore, 70 %	9 13 0		,,
Blende, 50 %	8 13 6		,,
Calamine	8 16 0		,,
Antimony, Star Regulus	62 0 0 to	63 0 0	,,
,, Ore 50%	15 0 0 to	17 0 0	,,

Messrs. Barrington and Holt, Cartagena, quote:—

Iron Ore.

		£.	d.	
Ord. 50%, f.o.b. Forman		7	8	per ton.
Do. ,, Cartagena		8	0	,,
Special low phos, ,, Forman				
Do. do. ,, Cartagena		8	2	,,
Extra quality do.		8	6	,,
Special Iron Ore ,, ,,		nominal		,,
Specular 58 % do.		11	0	,,
S.P. Campanil Coast		9	6	,,

TIMBER.

Messrs. Alfred Dobell and Co., Liverpool, quote for wholesale quantities on c.i.f. Liverpool terms:—

COLONIAL WOODS.

Timber.

		£	s.	d.	£	s.	d.
Quebec Square White Pine...	per cub. ft.	0	1	9 to	0	3	3
Quebec Waney Board Pine...	,,	0	2	8	0	3	9
St. John Pine, 18 in. average	,,	0	2	4	0	3	3
Lower Ports Pine	,,	0	1	3	0	1	8
Quebec Red Pine	,,	0	1	6	0	2	3
Quebec Oak, 1st quality	,,	0	2	9	0	3	4
Quebec Oak, 2nd quality	,,	0	1	6	0	2	6
Ash	,,	0	1	6	0	2	3
Elm	,,	0	3	3	0	4	0
Hickory	,,	0	2	0	0	2	6
Quebec Birch	,,	0	1	6	0	2	3
St. John Birch	,,	0	1	6	0	2	0
Birch Planks	,,	0	0	9	0	0	11
Spruce Spars	,,	0	0	10	0	1	0

Deals.

1st quality Quebec Pine	per std.	22	10	0	to	32	10	0
2nd do. do.	,,	17	0	0		22	0	0
3rd do. do.	,,	11	10	0		13	0	0
St. John, Miramichi, etc., Spruce	,,	7	10	0		7	15	0
Nova Scotia Spruce	,,	7	7	6		7	12	6
Spruce Boards	,,	6	7	6		6	12	6

UNITED STATES, etc., WOODS.

Pitch Pine.

		£	s.	d	£	s.	d.
Hewn	per cub. ft.	0	1	4 to	0	1	8
Sawn	,,	0	1	0	0	1	6
Planks, Stowage	,,	0	0	10	0	1	0
Boards, Prime	per std.	12	10	0	16	0	0
Oak Timber	per cub. ft.	0	1	6	0	2	6
Oak Planks	,,	0	1	6	0	2	1
East India Teak	per load	12	0	0	19	0	0
Greenheart	,,	6	15	0	7	10	0

EUROPEAN WOODS.

Timber.

		£	s.	d.	£	s.	d.
Riga Redwood	per cub ft	0	1	6 to	0	2	0
Dantzic and Memel Fir, Crown	,,	0	2	1	0	2	6
Dantzic and Memel Fir, Middling	,,	0	1	9	0	1	11
Stettin	,,	0	1	9	0	1	11
Swedish	,,	0	1	0	0	1	3
Riga Whitewood	,,	0	1	0	0	1	3
Norway Mining Timber	,,	0	0	9	0	1	0
Dantzic and Stettin, etc., Oak	,,	0	2	6	0	3	0
Norway Spars	,,	0	1	2	0	1	9

Deals.

Red Archangel and Onega, 1st quality	per std.	19	0	0		20	0	0
Red Archangel and Onega, 2nd quality	,,	14	0	0		16	0	0
Red Archangel and Onega, 3rd quality	,,	10	10	0		12	10	0
St. Petersburg, 1st quality	,,	16	0	0		17	10	0
Do. 2nd ,,	,,	14	0	0		15	0	0
Gefle	,,	11	10	0		16	0	0
Wyburg	,,	11	0	0		12	10	0
Uleaborg	,,	10	0	0		12	10	0
Gothenburg	,,	11	0	0		16	0	0

SELECTED PATENTS.

NEW PATENTS APPLIED FOR.

ENGINEERING—CIVIL, MECHANICAL, ETC.

277. F. W. THOMAS, Newport.—Improvements in metallic packings for piston rods and the like.

286. H. A. FRANCIS, London.—Improvements in and relating to ventilators.

[illegible]. W. B. SAYERS, London.—Improvements in and relating to turbines.

304. F. REICHENBACH, London.—An improvement in distributing valves for gas engines.

305. C. A. CARUS-WILSON, Strand, London.—Improvements in and or connected with railway wagons.

317. A. W. WALKER and W. W. WALKER, jun., Liverpool.—Improvements in or appertaining to rotary engines or pumps.

318. F. OGDEN, Keighley.—Improvements in or appertaining to means for lubricating rotary shafts or the like.

[illegible]. R. A. M[illegible], Glasgow.—Improvements in conveyors.

346. I. A. TIMMIS and R. B. TIMMIS, London.—Improvements in engines.

350. N. F. JOHNSON, London.—Improvements in and relating to the furnaces of steam boilers.

355. J. EVANS, London.—Improvements relating to the pistons, plungers or like parts of engines, pumps, and other machines.

358. C. H. R. SCHWARZ, London.—Improvements in pile-driving machines.

360. J. J. ELEY and T. NAWTHROP, London.—Improvements in wagon axle-boxes.

149. H. H. LAKE, London.—Improvements in devices for feeding air to furnaces.

151. F. W. HOWORTH, London.—Improvements in igniting mechanism for explosive engines.

164. H. SCHMIDT, London.—Improvements in shaping and cutting machines.

174. H. J. HADDAN, London.—Improvements in horse-power indicators and overload alarms for steam engines.

187. WILLANS AND ROBINSON, Ltd., and J. C. PEACHE, London.—Improvements in steam turbines.

229. J. KOFOED, London.—Valve mechanism for duplex steam pumps.

231. A. H. CURTIS and THE STURTEVANT ENGINEERING COMPANY, Ltd., London.—Improved unit system of bins shelving or pigeon holes for keeping engineers and all other forms of small part stores.

245. S. H. ADAMS, Scotswood-on-Tyne.—Improvements in sliding-disc valves.

246. S. H. Adams, Scotswood-on-Tyne.—Improvements in screw-down valves and the like.

270. A. ALLTREE, Manchester.—Improved locking device for levers, taps, nuts, and the like.

274. W. A. OUBRIDGE, Coventry.—Improvements in chucks.

275. C. RIDLEY, Coventry.—Improvements in or relating to valve grinders.

10. H. S. BOOTH, Manchester.—Improvements in the construction of cylinders and pistons of the trunk or single acting type applicable for motors, compressors, pumps, and similar apparatus.

23. A. DOBSON, Glasgow.—An improvement in the valve arrangements of steam or other engines.

47. F. S. HANDCOCK, W. RUST and L. DUNN, Bristol.—Improvements in smokeless furnaces for steam generators, brick kilns, and destructor furnaces.

63. R. E. PHILLIPS, London.—Improvements in apparatus for removing superfluous metallic coating from sheet metal.

68. A. J. BOULT, London.—Improvements in or relating to metallic piling.

89. B. HAIGH, London.—Improvements in smoke consumers for boilers, furnaces and the like.

93. A. J. CUMING, London.—Improvements in roller bearings.

97. C. E. S. MCCANN and R. COLSON, London.—Improvements in means for testing wires, wire-ropes, and the like, or for indicating variations in the cross-sectional area of wires, wire-ropes and the like owing to faults in manufacture, deterioration during use or from other causes.

115. J. T. COPE, Birmingham.—Improvements in the wings or blades of air propellers or fans and methods of fixing same.

117. J. SOUTHALL, Worcester. Improvements in hot-air engines.

130. A. HAUFF, Würtemberg.—Knife-grinding apparatus for planing machines.

371. G. C. MITCHISON, London.—Improvements in or relating to machines for the manufacture of blocks or slabs of plaster, cement and the like.

379. E. S. HOUGH, London.—Improvements in and relating to automatically operating safety valves for boiler gauge glasses and the like.

[illegible]. W. [illegible], London.—Improvements in locomotives.

386. T. HARFLEET and A. T. WHEELER, London.—Improvements in apparatus for taking samples from bulk of cement, sand or analogous substances.

397. J. WELLER, London.—Improvements in universally flexible joints for coupling shafting and for like purposes.

424. W. P. Thompson, Liverpool.—Improvements in steam generators. (Warren Seymour Johnson, United States.)

425. W. P. Thompson, Liverpool.—Improvements in apparatus for generating fluid pressure. (Warren Seymour Johnson, United States.)

430. L. A. Hindley, Wimbledon.—Improvements in steam boilers.

432. A. G. Carey and W. Lawrence, London.—Improvements in the method of circulating, heating, cooling, purifying and softening water and in apparatus therefor.

442. C. H. Jaeger, London.—Improvement in centrifugal and turbine pumps and the like.

ELECTRICAL.

21. G. H. Sidebotham, Manchester.—Improvements in automatic circuit breaking appliances for overhead trolley and other electric wires or cables.

24. W. E. Hitch, Oxford.—Improvements in or relating to electric cable conductors.

52. C. Jeantaud, London.—Use of a special active material for manufacturing accumulators.

[illegible] H. Perret, London.—Improvements relating to electric furnaces.

222. P. H. Thomas, London.—Improvements in vapour electric converters.

226. S. G. Brown, London.—An improved method of and means for obtaining and working electric currents of high periodicity.

238. V. A. Fynn, London.—Improvements in single phase alternate current commutator motors.

292. A. J. Boult, London.—Improvements in or relating to high pressure electrical apparatus.

295. G. C. Marks, London.—Improvements in telegraphic transmitters.

302. Siemens Bros. and Co., Ltd., London.—Improvements in electricity meters. (Siemens' Schuckertwerke G.m.b.H., Germany.)

[illegible] J. Wirth, London.—Improvements in electrical switches.

374. W. V. D. Kelley, London.—An improved thermal electric switch.

376. Siemens Bros. and Co., Ltd., London.—Method of and apparatus for influencing an electric circuit in dependence upon the load of a continuous current motor situated in another circuit. (Siemens' Schuckertwerke G.m.b.H., Germany.)

378. Siemens Bros. and Co., Ltd., London.—Improvements in electrical signalling apparatus. (Siemens and Halske Akt.-Ges., Germany.)

385. The British Thomson-Houston Company, Ltd., and F. Holden, London.—Improvements in and [illegible] starting apparatus.

MINING.

[illegible] Thomson, London.—An [illegible] bricking frame for circular and other shafts.

34. J. Blasweiler, London.—Flat mine-rope.

SHIPBUILDING, ETC.

106. G. F. Steede, Tralee.—Improvement relating to submarines.

161. J. Neumaier, G. L. Baldauf, and A. Klein, Liverpool.—Improvements in torpedo guards or nets.

188. L. J. Johnsen, London.—Admirals and captains life and messenger boat and improved wind shute, also storage boat.

[illegible] W. M. Walters, Liverpool.—Improvements in the construction of ships.

268. M. Houzeau, Paris.—Dismountable rudder with propeller-screw.

281. A. Hattan, Kingston-on-Thames.—Improvements in buoys for locating sunken vessels.

357. W. Wills and W. E. Crook, London.—Improvements in the propulsion of boats and the like vessels.

[illegible] R. Turner, Glasgow.—Improvements in and relating to stockless anchors.

437. O. Silberrad, London.—Improvements in explosives for use in torpedoes and the like.

IRON AND STEEL METALLURGICAL.

60. T. C. King, London.—Improvement in method of desulphurising and nodulising substances containing iron compounds.

67. G. T. Holloway, London.—A new or improved process for the production of zinc oxide from solutions of zinc salts.

74. J. Brooks, London.—An improved composition for moulds for metal castings, cores, and the like.

76. S. O. Cowper-Coles, London.—Improvements in the electrolytic manufacture of metal wire, strip or the like.

98. Societe Anonyme des Fonderies et Laminoirs de Biache Saint-Vaast, London.—Process and apparatus for mechanically discharging comminuted materials from receptacles, retorts, or crucibles whether cold or heated and in particular the crucibles of zinc-smelting furnaces.

165. J. M. Porter, London.—Improvements in exhaust mufflers.

[illegible] E. Hammesfahr, London.—Improvements in the manufacture of steel blocks and steel bars.

324. D. Bates and G. W. Peard, Liverpool.—Improvements in or connected with the annealing of metals.

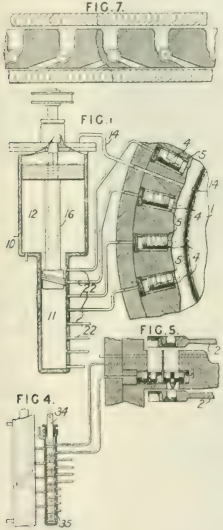
348. S. J. Robinson and G. Rodger, Sheffield.—Improvements in the construction of ingot moulds for use in compressing machines.

375. C. Schlickeysen, London.—Improvements in crushing mills.

347. Fraser and Chalmers, Ltd., London.—Improvements in toggle arms particularly adapted for use in rock breakers and like machinery.

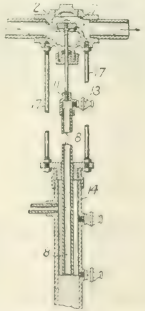
ABRIDGED SPECIFICATIONS.

J. Wilkinson, Birmingham, Alabama, U.S.A.—[illegible]—Relates to a method of governing the stage pressure in turbines divided into stages in each of which a wheel revolves is shown in fig. 1. Within the partition 1 are valves 4 which slide in the cylinders 5 so that, when they are in the inner position, the passage through the partition is closed, and *vice versa*. These



valves are fluid-actuated. One end of each cylinder 5 is connected to the cylindrical chamber 10, the other end being open to the stage fluid. Within the chamber 10 revolves a differential piston 34. Fluid from the boiler, initial stage, or other source of high pressure is admitted to the part 11, the stage fluid being admitted to the opposite end of the chamber by the pipe 14. The space 12 is open to the atmosphere. The oblique packing causes an intermittent or pulsatory flow to the adjoining pipe 22, thus preventing wire-drawing. The arrangement as applied to a reversing turbine is shown in figs. 4 and 5. The wheel 2 has two sets of vanes as shown in fig. 7, and the partition has two valves, separated by a partition. The ends of the valve chambers communicate with the cylinder 35 containing the piston valve 34. The alternate chambers of this cylinder are supplied with high-pressure fluid, the others being in communication with the differential piston chamber. By moving the piston valve 34, the inner or outer valves in the partition may be held closed, when the others are controlled as before by the differential piston.

T. M. Wilkins and C. E. Remsberg, Seattle, Washington, U.S.A.—19,152.—Relates to feed-pump regulators.—In order to keep the water in the boiler at a normal level, the supply of steam to a boiler feed-pump is automatically controlled by the contraction and expansion of a pipe 8 opening into a boiler column 14, or a part communicating therewith. The pipe 8 is connected to a throttle valve 7 in a casing 2 located in the steam-supply pipe of the pump, and extends within the boiler column to the normal water level. When the pipe 8 is filled with water and contracts, it draws the valve 7 to its seat. When the water level falls and the pipe 8 becomes filled with steam, the valve is opened, allowing steam to pass to



the pump. The casing 2, which has its inlet and outlet on opposite sides of the valve seat, is connected to a bush in the end of the boiler column by stays 17. The stem of the valve 7 is connected to the pipe 8 through [illegible] valve 13.

NEW PUBLICATIONS.

"ALTERNATING CURRENTS."

Their Theory, Generation and Transformation. By Alfred Hay, D.Sc.M.I.E.E. Harper Bros. 6s. net.

Profusely illustrated, this work is one that is bound to find favour with the student; the type is clear and the matter is set out in a manner conducive to lucidity. The author's aim has been to furnish the reader with a general account of the principles, construction and use of alternate-current measuring instruments, generators, motors and transforming machinery. Special attention is devoted to methods of testing. The first three chapters deal with the theory of the alternate-current, and the author informs us that he has endeavoured, as far as possible, to exclude everything of a purely academic or historical interest. On the other hand, he has not hesitated to devote ample space to matters which are either not generally understood, or which are of too recent origin to have found their way into many text books. Its practical usefulness is enhanced by a good index.

"HYDRAULIC TABLES."

By Gardner S. Williams, M.Am.S.C.E., and Allen Hazen, M.Am.S.C.E. New York, John Wiley and Sons. London, Chapman and Hall. 6s. 6d. net.

This excellent collection of tables has been drawn up to show the loss of head due to the friction of water flowing in pipes, aqueducts, sewers, etc., and the discharge over weirs, as computed by the Hazen-Williams hydraulic slide rule, based upon a given formula. All the computations of figures contained in the volume, except a few fundamental ratios, have been made with the slide-rule, and only such accuracy has been sought as can readily be obtained by this method of computation. But the tables should be useful to those not accustomed to the use of the slide-rule, and also to those who use the slide-rule, as a reference showing velocities and velocity heads, and establishing the position of the decimal point. The following is a brief synopsis of the contents; Increasing friction with age, how computed, and indicated in the tables; observations of flow in all classes of pipes; relative discharging capacity of aqueducts, also a table of flow in aqueducts; table of slopes required to produce certain velocities in sewers; tile sewer table, circular brick sewer table; decrease in carrying capacity of cast-iron pipe with age; comparison of results with those of Coffin and Weston; metric pipe table; loss of head in Venturi meters; under drains for sand filters, and flow over weirs.

BOOKS RECEIVED.

"Gas Oil and Air Engines." By Bryan Donkin. Fourth Edition, revised and enlarged. Charles Griffin and Co., Ltd. 25s. net.

"Dynamo Electric Machinery." A manual for students of Electrotechnics. By Silvanus P. Thompson, D.Sc., B.A., F.R.S. Seventh Edition. Vol II. Alternating-Current Machinery. E. and F. N. Spon. 30s. net.

"Visits and Excursions at the Sheffield Meeting, September 25th to September 28th, 1906." Reprinted by the authority of the Council from the Journal of the Iron and Steel Institute. Published at the offices of the Institute.

"Cornell University Library." Librarian's Report, 1904-1905

"Builders' Work in Its Legal Aspects." Edited by Paul N. Hasluck. Cassell and Co., 6s. net.

NEW CATALOGUES.

The General Electric Company, Ltd., have issued an entirely new catalogue of "Witton" single two and three-phase generators, with stationary armature and revolving field. The chief dimensions, etc., of these generators are carefully tabulated and their application is illustrated by a fine series of half-tone blocks.

Sturtevant Engineering Company, Ltd., Catalogue No. 43, dealing with Sturtevant "Steel Plate Fans," reminds us of the excellent scheme by which this company is now arranging for the filing of its literature in a special expanding catalogue cover. The construction of these fans is characterised by a heavy cast-iron standard which carries the two self-oiling bearings, affording rigid support to the shaft, and ensuring durability and smooth running for long periods without special attention. The casings and wheels are built of substantial steel plate; the wheel is overhung on the shaft, leaving the inlet entirely unobstructed so that pipe connections can readily be attached when necessary. "Steel plate" fans are used for ventilating and drying purposes, especially in connection with Sturtevant steam air warmers; in mechanical draught installations both for land and marine boilers; for removing smoke from forges, and for exhausting steam, foul gases, etc., from spaces in which they are produced.

Attention is drawn to the fact that the true test of a fan's efficiency is not simply its volumetric capacity against no resistance, but its volumetric capacity per horse power when working against a specified resistance. A small fan run at high speed although possibly cheaper in first cost, may easily require 50 per cent. more power than a larger fan run at a slower speed would take to do the same work. The catalogue is fully illustrated.

The Delta Metal Company, Ltd., East Greenwich, S.E., have issued an interesting description dealing with their high-speed brass. They have produced an alloy by the extrusion process, aptly named "Dixtrudo," which is likely to cause somewhat of a revolution in the manufacture of small brass articles. The extrusion process invented by Mr. A Dick is already well-known, and articles produced by it are in common use. "It consists in the squirting of heated metals through dies of any conceivable shape by means of hydraulic pressure, frequently exceeding 30 tons per square inch. Such pressures exerted upon the metal while in a semi-plastic condition give a highly homogeneous product, strong, ductile, and free from the defects frequently found in ordinary castings. The process has now been developed to such a high pitch of perfection that by a judicious mixture of the ingredients a brass can be produced of almost any section which can be tooled at a speed far beyond the dreams of brass turners. Indeed, it is claimed that for small articles which have hitherto been cast in the ordinary way, not only can a better article be produced from extruded bars of the new metal, but also on account of the enormous speeds at which they can be finished by unskilled labour an appreciable saving can be effected in the cost of the ultimate product."

PAGE'S WEEKLY — Miscellaneous

CALLENDER'S
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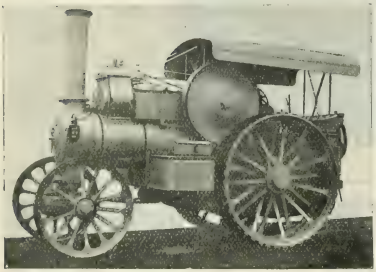

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Fowler's Road Engines effect a saving of 40 per cent. to 60 per cent. over Animal Traction.

Steam Road Rollers and Road Scarifiers

The Best.
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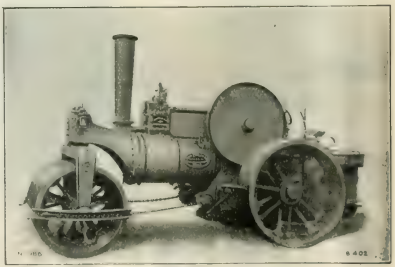
Fowler's Road Rollers are so designed that they are easily converted into Traction Engines.



All above Engines can be used for Driving every Kind of Machinery by Belt.

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For the Production of Steel and Iron Castings of Highest Qualities,

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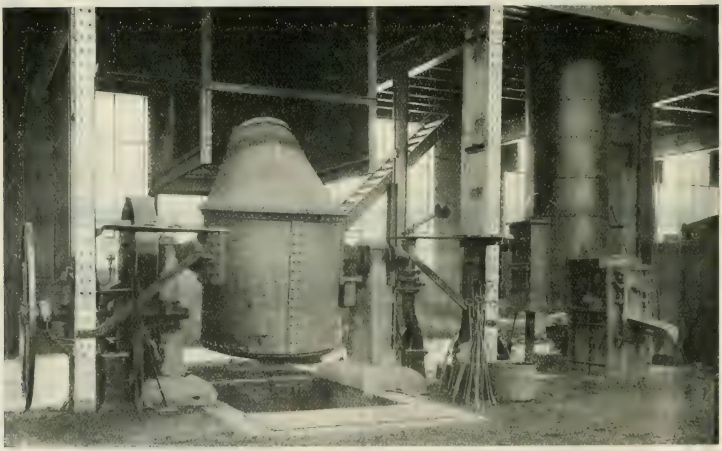

REFERENCES:—

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THE BURGEOISE CO., LTD., BRUGES.
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NORTH GERMAN LLOYD REPAIRING SHOPS, BREMEN
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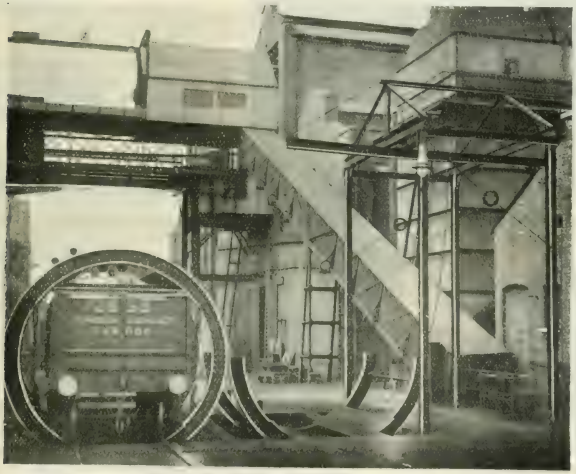

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PAGE'S WEEKLY — Miscellaneous

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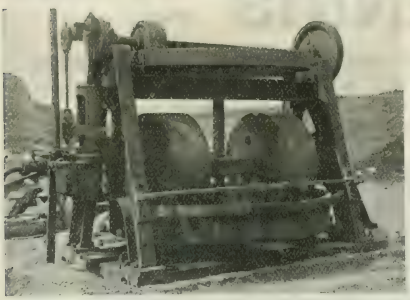

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Designed to stand
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Requires less Power to drive than any Mill on the Market.

Note the Guards round Pan and Gearing.

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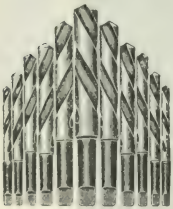
Telegrams: "DESTRUCTOR." Codes: A.B.C. (5th Edition) and LIEBER'S STANDARD.



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Taps,
Milling Cutters,
Reamers.

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CHEMNITZ (Saxony).

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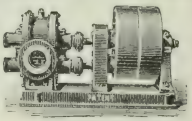

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4,000 Pumps under my System (with a capacity up to 15,000 litres per minute) in use

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Entirely of Iron without packing for high pressures to 0·3 atm.

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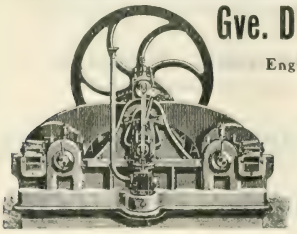

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A SPECIALITY.

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Capital fully paid up: 60 000 000 Marks

Machine Works ◦ Electrical Apparatus-Works ◦ Cable Works
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Electric Tramways.

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1700 km Track. ◦ 4300 Carmotors. ◦ 3500 Cars.

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Tramways for Mines and Iron-Works.

Continuous Current. **Threephase Current.**

Agencies throughout the World. XI. 8.

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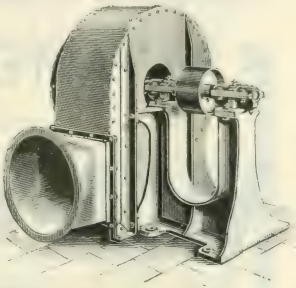
"SIROCCO" FANS,

"SIROCCO" AIR HEATERS,

AND

"SIROCCO" AIR COOLING AND FILTERING APPARATUS.

Highest Award, Grand Prize, St. Louis Exposition, 1904.



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OF ALL DESCRIPTIONS

CAN BE OBTAINED FROM

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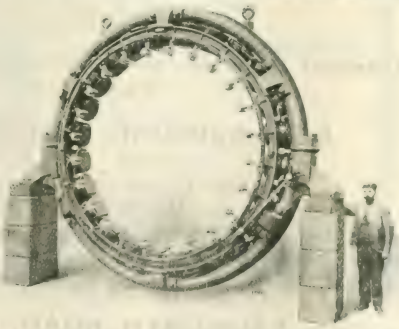

This Illustration shows a Magnet Ring, and Brush Gear of a 600 kw continuous current Generator.

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S.S. "AMERIKA," THE NEW HAMBURG-AMERICAN LINER,

IS FITTED WITH

WAYGOOD LIFTS

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The Lifts carried 5,000 Passengers.

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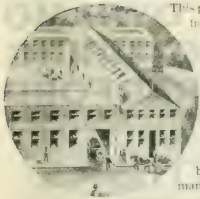
PAGE'S WEEKLY Electrical Apparatus



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Note the Name and Address:

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Victoria Electrical Works,
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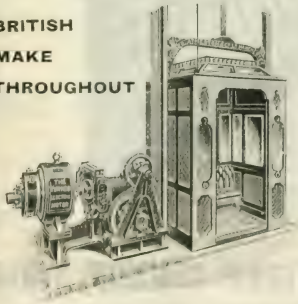
BRITISH MAKE THROUGHOUT



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Reliable,
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PAGE'S WEEKLY Electrical Apparatus

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WHILST OUR PRICES ARE EXCEEDINGLY LOW. Write for Particulars.

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